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In 1961 a three year study was inaugurated in Hampshire County, England, to investigate the possible applications of closed-circuit television in secondary schools. The study included investigations of new teaching methods and of the technical, financial, and administrative arrangements prerequisite to the use of television on a large scale. The first phase focused on the use of the equipment in a single classroom which was then linked to a second classroom. The second phase saw the construction of a studio and the linking of the original school with two others by cable. Studio teaching methods, production techniques, program content, and the balance between enrichment and curriculum materials were the foci of this phase. The third phase was concerned with an objective program assessment, consisting of a series of controlled experiments to ascertain the most effective uses of the television medium. Some of the more important findings indicate that television teaching is equal or superior to conventional instruction; programs must be directed to a limited ability range; students show high interest in locally produced programs; lesson and teaching notes should be issued for each broadcast; and a talk-back system on a limited scale is effective for establishing pupil-teacher communication. The report includes information on facility design and administration, production techniques, and staff use. (MT)

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THE WARBLINGTON EXPERIMENT IN CLOSED-CIRCUIT TELEVISION.

THE
FINAL REPORT

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

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25th October 1965

WARBLINGTON EXPERIMENT

THE FINAL REPORT

PREFACE

1. Details of the Experiment describing the three year investigation into the uses of closed-circuit television in schools are set down in Part I of the Report, the Objective Assessment of the final year's work comprises Part II and a view of the possible applications is contained in Part III.

2. Part II of the Report was prepared by the Research Worker, Miss J. Munro, in close consultation with Mr. D. Pidgeon, Deputy Director of the National Foundation for Educational Research.

3. The remainder of the Report was prepared by the Head of Television Studies at Warblington School, Mr. P. S. Dutfield.

4. The Headmaster of Warblington School, Mr. E. J. Rankin and the Secretary of the Supervisory Committee, Mr. E. H. Littlecott, have made valuable suggestions throughout the preparation of the Report.

5. Special acknowledgments are due to:—
   The Chief Engineer of Southern Television Limited, Mr. V. G. Hawkeswood, for his review of technical material.
   The Studio Designers, Messrs. V. Bellars and J. Holloway, for their valuable contribution to the sections on Design.
   The former Headmistress of Broom Field County Secondary School, Miss J. V. R. Gregory, and the Headmaster of the Havant Grammar School, Mr. C. R. Rivers-Moore, for their help in the preparation of the section on the Link.

6. The scope of the Experiment would have been severely limited without the special efforts of the secretarial and technical staff of the Studio, the participation of visiting speakers and the generous help given regularly after school hours by so many local teachers.

7. Finally, the Education Committee of the Hampshire County Council express their appreciation to Southern Television Ltd. for inviting them to undertake the experiment and for administrative, technical and financial help which has made the experiment possible.

OUTLINE OF MAIN CONCLUSIONS

A. AN EXTENSIVE AND PRACTICAL STUDY

An investigation extending over three years ensures that a considered opinion can be formulated on the applications of closed-circuit television in schools. To answer specific questions, quantitative analyses of human behaviour have been made using experimental techniques under the guidance of the National Foundation for Educational Research. Other findings are the subjective evaluations of practising teachers on the efficacy of new professional techniques.

B. USES

The application of closed-circuit television depends upon the type of equipment available. Conversely, equipment must be selected for a specific task. Considering the whole range of apparatus, there are six main applications:—

1 **Within one classroom or laboratory**—this has limited application because of technical, operational and space problems.

2 **Linking two classrooms**—can be effective but there are limitations.

3 **Using a Studio**—serving a large school or campus. Administration is simpler within one autonomous institution.

4 **A Studio linking a large number of separate institutions**—only useful on a large scale.

5 **A training Studio**—to provide in-service training in a locality or in a College of Education.

6 **Observation facilities for teacher training**—providing for child study or experience of general classroom procedures.

C. COSTS

The supposition that all closed-circuit television is costly is misleading. Simple camera chains for the magnification of detailed processes and for teacher training facilities are relatively cheap to install. Both capital and running costs are, however, much higher for a studio project, which should incorporate good relay, equipment and staff facilities.

D. EFFECTIVENESS

Most pupils gain information from the television screen at least as efficiently as they do in the conventional teaching situation.

When a number of classes is taught simultaneously, it is advisable to:—

1 Present lessons to a limited range of pupil age and ability.

2 Issue teachers' notes for each lesson.

3 Provide for preparation and follow-up by the class.
4 Ensure adequate viewing conditions.

E. FURTHER CONSIDERATIONS

When closed-circuit television is used in more than one classroom, relevant considerations are:—

1 Administration—*timetable and curricula adjustments.*
2 Technical —*extension of equipment maintenance.*
3 Professional —*adaptations and extensions to the role of the class teacher.*
4 Human factor —*team co-operation in a new teaching medium.*

F. GENERAL

Closed-circuit television can be a powerful teaching aid. The cost, application and problems associated with its use vary according to the scale on which it is employed. Television in education depends for its success upon the provision of skilled technical maintenance and the training of teachers in its applications. In the classroom its effective use certainly does not involve the relinquishment of the traditional teacher/pupil relationship. Used with care and discrimination, its value as an aid to teaching is indisputable.

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PART I. DETAILS OF THE EXPERIMENT.

INTRODUCTION

1. General. The Warblington Experiment has been a three year study, by practising teachers, of the possible applications of closed-circuit television equipment in schools. Confined mainly to the secondary field, it has provided for the investigation of new teaching methods and of the technical and administrative arrangements prerequisite to the use of closed-circuit television on a large scale.

One teacher was relieved of normal school responsibilities at the end of Phase I to specialise in the work. Technical and secretarial help was later provided but, at the start, no additional staffing provision was made for the conduct of the Experiment. The rest of the teachers participating in television teaching have undertaken the work in addition to their school duties.

The range of the Experiment has extended from work within the classroom to the use of a well equipped studio providing a wide variety of academic material prepared for differing age and ability groups. Programme content has included direct teaching and enrichment material supplementing the conventional curriculum. The Experiment was carefully phased to investigate, first, the use of equipment within the classroom, secondly, the operation of a studio and the association of teachers experienced in the preparation of more elaborate television material and, finally, with guidance from the National Foundation for Educational Research and within the limits of a school-based project, the objective assessment of those aspects of the work that lent themselves to quantitative analysis.

The Final Report on the Experiment completes a series submitted to the Supervisory Committee—a body whose role has not been executive, but more like that attributed by Bagehot to Queen Victoria, to advise, encourage and warn.

The work described has depended to a degree on the advice and help of professional broadcasters and engineers and on the knowledge gleaned from a study of American experience in the field. Even so, the bulk of the work has comprised an original contribution to educational practice and research.

2. The Supervisory Body. In the Autumn of 1961, Southern Television Limited approached the Education Committee of the Hampshire County Council with the offer of a grant towards the cost of an experiment to be conducted in the use of closed-circuit television in schools. They also offered all necessary technical assistance required for such a project, It was estimated that the duration of the experiment would be at least three years and that it would cost approximately £10,000. The offer was warmly accepted on behalf of the County Council and a Supervisory Committee was appointed to advise on the conduct of the experiment and to issue progress reports from time to time.

The Supervisory Committee is as follows:—

ASSOCIATION OF EDUCATION COMMITTEES:

Mr. A. H. Quilley, M.B.E., J.P., C.A., Chairman, Education Committee; Chairman, Further Education Sub-Committee, Hampshire County Council. Executive Committee Member and Vice-President of the Association of Education Committees.

HAMPSHIRE COUNTY COUNCIL: EDUCATION COMMITTEE:

Mr. J. W. Parr, M.A., C.A., Vice-Chairman, Education Committee; Chairman, Secondary Education Sub-Committee, Hampshire County Council.

Mrs. M. Perraton, C.C., Chairman, Primary Education Sub-Committee, Hampshire County Council and Chairman, Education Committee, Havant and Waterloo Urban District Council.

Mr. R. M. Marsh, M.A., County Education Officer, Hampshire County Council.

NATIONAL UNION OF TEACHERS:

Mr. W. A. Baker, J.P., Schoolmaster and Member of the Executive Committee of the National Union of Teachers.

NATIONAL FOUNDATION FOR EDUCATIONAL RESEARCH:

Dr. W. D. Wall, B.A., Director, National Foundation for Educational Research.

NATIONAL COMMITTEE FOR AUDIO-VISUAL AIDS IN EDUCATION:

Dr. J. A. Harrison, Director, National Committee for Audio-Visual Aids in Education.

UNIVERSITY OF SOUTHAMPTON:

Professor F. W. Wagner, Professor of Education and Director, Institute of Education.

SECRETARY OF THE SUPERVISORY COMMITTEE:

Mr. E. H. Littlecott, B.A., D.P.E., Deputy County Education Officer, Hampshire County Council.

ASSESSOR:

Miss J. M. Bosdet, H.M. Inspector.

OBSERVERS:

Southern Television Limited:

Mr. C. D. Wilson, M.C., Managing Director, Southern Television.

Mr. Charles Cross, Education Officer, Southern Television.

The Hampshire Education Committee invited Mr. G. A. Richardson, B.Sc., a Headmaster of wide and mature experience, to conduct the Experiment in his school, the Warblington County Secondary

School, Havant. After the untimely death of Mr. Richardson, the general supervisory role was assumed by the new Headmaster, Mr. E. J. Rankin, M.C., B.A.

3. The Phasing of the Experiment. The minimum duration of the Experiment was fixed at three years to allow ample time for the investigation and development of suitable techniques in television teaching. Six months were spent in familiarising the school staff with the equipment, during which time the Engineering Staff of Southern Television gave great assistance in instructing the teachers and in helping them to appreciate both the possibilities and the limitations of the technical side of the medium.

The Experiment now continued in three phases:—

PHASE I. Beginning in September 1962, Phase I extended over a complete academic year. The equipment was confined to one classroom which, at a later stage, was linked to a second room. The methods of teaching directly to a class and to a remote class simultaneously were investigated, the technical prerequisites were closely reviewed, and the impact on school organisation was particularly noted.

PHASE II. The next full academic year saw the construction of a well equipped studio and the linking of three schools by land-line. A close study was made of studio teaching methods. With the presentation of more elaborate programmes, design and caption material featured prominently. The range of subject material widened and the number of students and teachers participating in the work increased. Production procedures were established. A useful balance was struck between curriculum and enrichment material.

PHASE III. The principal feature of Phase III was the objective assessment undertaken in close consultation with the National Foundation for Educational Research.

PART I. CHAPTER 1.

PHASE I—SEPTEMBER, 1962 to JULY, 1963

1. Introduction. For the first year, the transmission equipment was used in a classroom in regular use by classes of up to 40 pupils. With dimensions of 28 ft. by 23 ft. approximately and furnished with the many accoutrements of a well used classroom, the introduction of the equipment caused congestion. The equipment was regularly covered and the cables coiled when not in use. Rigidly administered precautions were taken to ensure the safety of both machine and pupil. It was found that the surest way to obtain the children's close co-operation was to satisfy their fascination at the outset. In the first fortnight, some ten minutes were allocated during each double teaching period (approximately 80 minutes) for children to assist in assembling the equipment. Great care was exercised to ensure that the most enquiring pupils, particularly in the lower streams, had the opportunity to uncover a camera, coil cables and connect apparatus. This was done under supervision, and before long, pupils could be relied upon to harm neither themselves nor the equipment.

With the fascination of the young at least partially satisfied, the equipment could now be used without disturbing the ordinary classroom routine to any great degree. This consideration was to be a feature of the Experiment throughout, namely, as far as possible, to conduct the investigation without disrupting the normal running of the school.

2. The Apparatus. The apparatus initially installed comprised two Dage cameras of 625 line standard and dolly mounted. Camera 1 was a viewfinder camera with a manually operated lens turret. Camera 2 incorporated a remotely controlled lens change turret and optical focus and was linked with an 8" preview monitor. The camera control units were mounted together in a temporary console structure.

Four 23" monitors, two parabolic dish microphones, a small sound and vision switching panel and a variety of wall-mounted connecting boxes completed the equipment.

3. Viewing Arrangements. It was decided to begin by linking two classrooms. Some pupils in the originating room could see the teacher and his visual material directly. For those whose view was interrupted by equipment, two monitor screens were set at angles along the side wall, and used also as transmission monitors by the teacher and camera man. In the receiving room, fitted with venetian blinds to offset glare, a suitably placed 23" monitor, incorporating a loudspeaker, was supplemented by the parabolic dish microphone centrally fixed above the wall-mounted blackboard in front of the class. A simple bell-push device activated a muted buzzer in the transmitting room when questions or technical difficulties arose in the receiving classroom.

4. The Use of Two-way Sound

A. OPERATING PROCEDURE

If a child asked a question, he would first raise his hand, when the teacher would operate the bell-push and a buzzer would sound in the transmission room. The television teacher would now call for the question, throw the two-way switch on his control panel and the questioner could then be heard. Within the first week this procedure was completed speedily and with confidence.

B. TEACHING USE

Questions originating spontaneously from a puzzled pupil occurred as infrequently in the television teaching situation as in the ordinary classroom. When considered as an element in teaching technique, questioning is a means by which the teacher develops an idea by posing the questions himself. In the television situation, this conventional technique retained its impact and proved simple to operate. The teacher would state a problem ask for a solution and then name a pupil in the remote room. Immediately, the two-way switch would be thrown and the responding pupil would simply make his reply without the need for any further technical operation.

C. EFFECT ON THE PUPIL/TEACHER RELATIONSHIP

The use of the simple two-way sound device proved invaluable in establishing a satisfactory relationship with the remotely situated pupils. This technique, coupled with the intelligent use of the camera belied the criticism sometimes made that television destroys the pupil/teacher relationship. There was no doubt in the mind of the television teacher and of those teachers observing, that a real contact was made with the pupils. This does not mean that television created this relationship, but simply that, as a vehicle of communication, television enabled a particular style of exposition to be received in more than one classroom.

5. The Classes Receiving Television Teaching. From September 1962 the first two streams of the first-year age group received a weekly television lesson in Mathematics, the top stream in the transmission room and the second stream in the receiving room. The ability range of a total teaching group of 72 pupils soon led to difficulties. The weaker pupils in the second stream found the pace too rapid. Consequently, from Whitsun 1963, the second stream was replaced by the first-year top stream of Broom Field County Secondary School, and this class travelled to Warblington School for a weekly television lesson.

6. The Material Presented. In view of the need for a more realistic approach in the teaching of Mathematics, television was seen as a possible way of introducing pupils to Mathematics more appropriate to the needs of today. At Warblington School, modern Mathematics had been taught with success and in television was seen a possible means of communicating the vigour of this material to a wider audience. It was also thought that teachers might be interested in seeing a colleague at work.

The Mathematics course, to be conducted by means of the new medium, was to contain unfamiliar subject matter. Emphasis was placed on mathematical ideas rather than on specific processes, although there was inevitably an incidental element of instruction in basic skills. The topics discussed were: The Analysis of Shape and Form; Theory of Numbers; Arithmetic of the Computer; Probability; Mathematics and Music; Mathematics and Art; Topology; Mathematics and Astronomy; Number Couples and Triples; Greek and Egyptian Mathematics; The Paradox; Data Processing and an Introduction to Mechanics. The intention was to thrust the young viewers vigorously into a world of new ideas in the hope that the more formal mathematical training in the classroom would be undertaken with new understanding and enthusiasm.

7. Production Procedures. Every effort was made before the first lesson to ensure that all would go smoothly, but the experimental nature of the work made it necessary for the teacher to learn as the series progressed. Inevitably mistakes were made, but many ideas emerged during the presentation of the early lessons. Within the first month a production routine was established.

A. PRODUCTION COMMITTEE—TEAM TEACHING

At this stage the Television teacher continued to undertake his full professional duties and so preparation procedures were necessarily trimmed to the time available. A small production group was formed, comprising:—

(i)	The teacher of the receiving class	Mr. P. Olden
(ii)	The Head of the Art Department	Mr. J. Holloway
(iii)	A teacher, manually skilled, to prepare three dimensional visual material	Miss P. Chapman
(iv)	The Headmaster-*ex officio*	Mr. G. A. Richardson
(v)	The Television teacher in the Chair	Mr. P. S. Dutfield

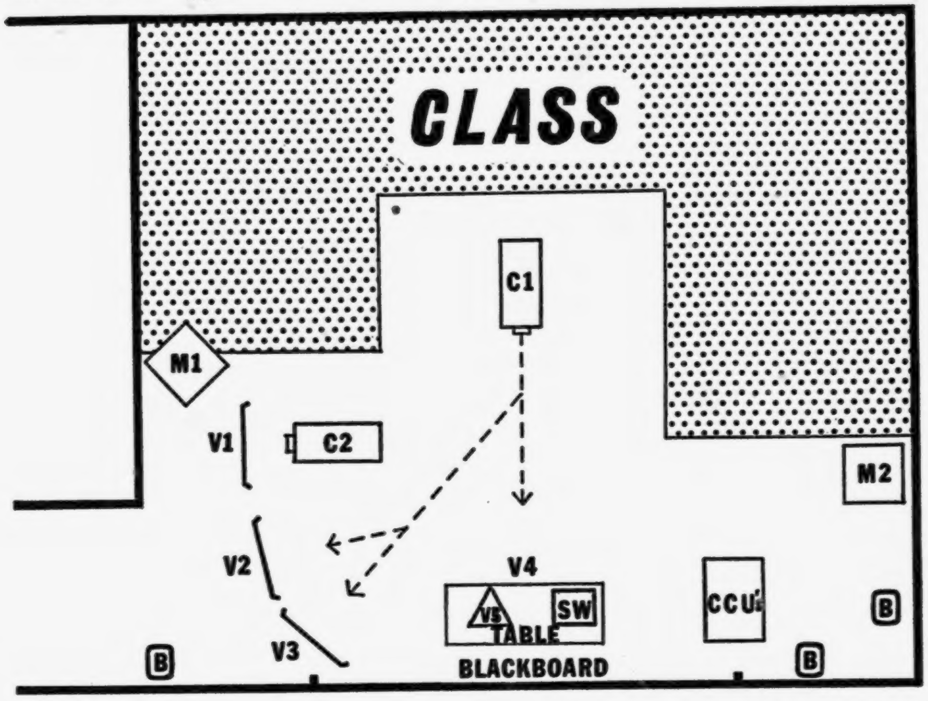
To illustrate the freedom which the Television teacher enjoyed in trying out his ideas fully, the Headmaster would simply sit in on the group's meetings as an observer and advise as to whether the proposals made were administratively possible.

The production group would meet in the lunch break on Thursdays to discuss the previous day's lesson and plan the work for the following week. These brief, but regular meetings were valuable, but it was realised from the outset that production could not be undertaken by a committee. As in the production of a play, the producer's decision had to be final and both the Headmaster and the teachers involved generously supported the Television teacher in this spirit.

B. TRANSMISSION ROOM ARRANGEMENTS

The classroom was rearranged for transmission purposes on the lines set down in the diagram below. Some of the disadvantages, are immediately apparent. Space for pupils was limited, the range of visual material could be seen in advance and where the effect of such material depended on timing, the impact was lost. Some pupils' view was interrupted on occasion by apparatus and a monitor screen was used (M1) but generally the result was an unsatisfactory learning situation, with few of the advantages of face-to-face conditions. It proved impossible to teach to the camera and to a live class simultaneously. If attention was paid directly to a pupil in the transmission room, contact was lost with the viewing pupils. Since an intelligent use of the camera and an effective use of two-way sound firmly established such a contact, the live audience could not be allowed to intervene.

Diagram of Room 8, Warblington School, Showing General Arrangements for a Typical Transmission (not to scale).



KEY

V1 — Visual material on stand covered by camera 2.
V2, V3 Visual material on stand covered by camera 1.
V4 — Visual material angled below table level.
V5 — 3-dimensional visual material on table.
SW – Vision and sound switching box on table.
C.C.U.s Camera Control Units.
M1 — Class monitor.
M2 — Transmission monitor.
C1 — Camera 1—viewfinder/turret/dolly.
C2 — Camera 2—remote control turret/focus plus integral monitor.
B — Wall-mounted distribution boxes.

8. The effects of the Phase I Mathematics Course. Test results, note books, pupils' questions and an increasing use of the Mathematics section in the Library all indicated that the pupils not only gained information from the Television course but also developed a new interest in the subject. The use of two-way sound had maintained a contact between pupil and teacher. Careful use of the sound link elicited answers that were often animated and counter questions confidently asked. The teacher was not isolated from his pupils. The enlivened response of the pupils did not seem to be inhibited by the presence in the receiving room of the Headmaster at every lesson. The teacher in charge of the receiving class—a Mathematics specialist in his first year of teaching—played an important role, not only in giving on the spot advice and encouragement to the pupils but also in his suggestions to the weekly Production meeting. It had sometimes been suggested that a qualified teacher need not be present in the receiving room. A particular study of this was made later in the Experiment, but the experience of the Phase I Mathematics course indicated that the teacher in the viewing room had an essential role to play. He set the tone in the room. The response of the pupils was to some degree a reflection of the attitude of the teacher. He saw in the Experiment a need to try things out rather than prejudge issues and his co-operation helped the pupils to overcome any preconceived attitudes they had towards the new medium.

It was possible then to link two classrooms and transmit viable teaching material, to elicit a keen response from pupils, to establish a relatively high academic standard and to use the teacher in the receiving room in a positive way. In spite of this the question remained: was this the most effective use of the equipment? From the transmission point of view limitations were apparent, notably insufficient visual material, lack of preparation and rehearsal time and congestion due to the presence of a class of pupils in the transmitting room. Even to achieve a simple classroom link, a considerable amount of equipment was required. This had to be stored at the end of the lesson and brought out again to be used. Setting up, warming up and testing took about an hour each time.

The report of the late Headmaster on his American tour instanced few occasions when cameras were in a classroom and then only for the particular purpose of pupil observation. At this point of time in the Experiment the question arose as to whether the teacher teaches to the camera, to the class, or to both. The impact at the receiving end seemed greater when the teacher talked to the camera. Each pupil viewing the monitor screen then had a front seat. This provided a one-to-one pupil/teacher relationship contrasting with the one-to-many situation inevitable in much class teaching. The need for a Studio was indicated.

The production of a clear picture meant skilled manipulation of the camera. This could not be done by the teacher. The communication system developed defects which could only be remedied by someone with technical knowledge. Lighting conditions were often poor, the classroom links were prone to damage and without the weekly visit of Southern Television Limited engineers to help in operation as well as maintenance, very little would have been achieved.

The television work in Mathematics implied the overcoming of traditional but understandable prejudice on the part of some practising teachers who still doubted whether anything approximating to direct teaching could possibly succeed in any situation other than the traditional face-to-face one in a classroom. Some teachers still suspected that the American evidence was not applicable to English schools. It was salutary then to produce some television teaching, albeit haltingly at first, and gain the co-operation of staff in solving the practical problems that emerged. This was better than indulging in theoretical disputation.

Overseas evidence indicated that the co-operation of teachers in Educational Television experiments increased once they had gained direct experience of the new method. The Experiment provided this first-hand experience of the use of television. The achievement of the first year's work in integrating television teaching into the first year Mathematics timetable and in providing the experience of an extensive period of Educational Television was recognised in the recommendations to extend the field of enquiry and notably to install a fully equipped Studio.

9. Other Work Undertaken in Phase I. Apart from the effective demonstration of dissection in Biology lessons undertaken in the preliminary period, Phase I saw other work for periods shorter in duration than that of the Mathematics Course. Close-ups of Ordnance Survey maps were presented on the screen. With careful lighting and focussing, a clear picture was obtained. Even so, insufficient detail could be discerned from seats beyond the first six rows of the classroom and this particular experiment was not pursued.

NEEDLEWORK

Attempts were made to use the equipment for magnification purposes within the needlework room. The wiring system was such that both cameras could operate from any of a number of rooms. It was simply a matter of moving the cameras, monitors and camera control units to the Needlework Room on the appropriate day.

The Needlework teacher had felt that one of the problems in teaching her subject was the difficulty in demonstrating to a class. In classroom lessons, attempts had been made to solve the problem by using large upholstery needles, thick wool, hessian and large cardboard buttons, but without much success. The actual size of a stitch and the method of holding the work could not be shown.

Large diagrams could be used to illustrate stitches and processes, but this was not considered to be the best way to teach a practical subject. The alternative would be to demonstrate to each child individually.

Now the television camera was seen as a way to enlarge hands as well as needle, thread and material. A class was arranged in three groups, each girl with her own sample of material on which to work. Two groups faced the monitors and a third group of left-handed pupils faced the fitting mirror, seeing a laterally inverted reflection from a monitor. Later a second camera with picture reversed was used to achieve the same result, but the use of more than one camera made this type of lesson too complex.

The colour of materials and thread is important and it was found that yellow thread on dark green material showed up well. Again, the texture of the material is important in relation to the amount of light it reflects. With this in mind, care was taken to provide suitable background.

The teacher could not operate the equipment on her own apart from the setting up. A skilled camera man was needed, leaving the teacher to concentrate on her own task. Finally, the varying light conditions of the classroom created problems similar to those experienced in the Mathematics work. Attempts were therefore made to darken the room and to introduce portable floods, but by this time the classroom was no longer recognisable as such. The need for Studio conditions was again indicated.

FURTHER EXPERIMENTS

In addition to the teaching work described above, further experiments were undertaken. On two occasions in Phase I apparatus was used out of school hours for demonstration purposes. Attempts were made with some six members of staff to prepare a more elaborate programme than was possible at that stage to use for teaching purposes. In April, 1963, a half-hour programme was devised for members of the local branch of the Guild of Teachers of Backward Children. The aim was to investigate the possibility of using the medium of television in the field of remedial education. A short exercise in story-writing was developed by the specialist teacher of remedial children. Some mathematical ideas were also presented. In July 1963 a further demonstration was prepared for the total teaching staffs of Warblington and Broom Field County Secondary Schools. On this occasion, a magazine type programme was prepared to give the Staffs an idea of the range of experiments that had been tried up to that time.

Both these demonstration programmes were followed by discussions which proved to be interesting intellectual exercises. However, it became evident that groups of teachers meeting in this way to discuss general ideas were not likely to produce constructive proposals for experimentation. This added weight to the view that the correct approach was to get the work moving; then the interest of the teachers could be aroused and their co-operation sought.

10. Phase I.—Findings. After the first year's work with the equipment still in the classroom, it was possible to make several recommendations and to reach certain conclusions:—

(1) All main equipment should be confined to an area away from the classrooms, preferably in a separate studio, for the following reasons:—
   (a) Equipment in the classroom distracts the pupils and makes it difficult to move around owing to the general congestion in the room.
   (b) Variation in intensity of daylight entering through the classroom windows affects the picture quality and limits the use of the cameras.
   (c) Camera operation and adjustment, the changing of captions, sound control and other "production" requirements cannot be adequately handled by the teacher giving the lesson.

(2) It was apparent that the use of television cameras within one classroom or laboratory had little application, apart from the magnification of a detailed process. If such magnification were required, a simpler and cheaper camera chain would suffice.

(3) There was little doubt that the Mathematics series had been well received. The pupils had shown interest and had gained a considerable amount of information from the Course of a relatively high academic standard, as the tests and notebooks show. Here was a further justification for the use of the medium. It had been demonstrated that it was possible to teach children successfully by means of television. Even so, this fact had to be approached with caution; one year was a relatively short time. The novelty of the medium increased the enthusiasm of both teacher and pupil. The subject material itself was of a new and exciting nature and no doubt contributed further to the encouraging response of the pupils. Finally, the work was still on a small scale administratively. It remained to be seen whether the smooth integration of television into the school time-table could continue to be effected on a larger scale and when organisation was initiated from a remote Studio.

(4) It had become clear that special staffing arrangements needed to be made. The growing demands of the experiments made it increasingly difficult for the teacher responsible for the television work to fulfil his other school commitments satisfactorily. It was clear that the further conduct of the Experiment was to be a full-time job and would need both secretarial and technical assistance.

(5) The number of teachers involved at this stage had been relatively small. It was becoming possible to widen the scope of the work and involve more teachers with varying talents and specialisms, now that the initial foundations of the Experiment had been laid.

(6) Although it was apparent that some modification of the classroom technique would be necessary, in the event it was found that the need for change was less than expected. What happened was that the teacher brought his professional expertise to television teaching. Television merely delineated a new area within which the individual expository techniques of teachers could find expression. Thus it was that having made allowance for the limited demands of the cameras, detailed rules of production were not needed. The camera could become the servant of the teacher.

(7) The use of pupils on the screen was considered. Apart from the assistance of an occasional pupil, for example, in the music series, to demonstrate the vibration of a stretched string and, again, in dramatic incidents to create a humorous introduction to the Mathematics of the Maze, the use of pupils was avoided. The viewers in the receiving room expected teaching material that would hold their attention and not insult their intelligence. The exhibitions by rehearsed pupils would have been embarrassing and by unrehearsed pupils, futile. In general then, the use of pupils on the screen was avoided.

(8) To achieve smooth operation of the equipment required not only the maintenance services provided by Southern Television engineers, but also a general mastery of the equipment by the teacher responsible, and assistance with camera operation. Much out of the school time was spent studying the workings of the equipment and it became increasingly clear that this was a role for the specialist. If closed-circuit television was to be applied to education, then the role of the teacher should be to make use of the equipment rather than make it work. A full-time qualified technician was needed to maintain the equipment and make it ready for use.

11. American Experience..... based on the Report "Educational Television in the United States" by the late G. A. Richardson, formerly Headmaster of Warblington County Secondary School.

In October 1962, Southern Television Limited and the Hampshire Education Committee arranged for the late Mr. G. A. Richardson to visit the United States of America to see as much as possible of the use of educational television on both closed and open-circuit systems. It was hoped that this experience would provide a point of reference to guide the work of the Warblington Experiment, then entering its Second Phase.

The following are summarised extracts from Mr. Richardson's Report:—

A. PITTSBURG

Mr. Richardson was particularly interested in the community educational Station operated as a non-profit organisation providing cultural, educational and informational programmes for all age levels in schools and homes. The television teaching material was here regarded as valuable for the in-service training of teachers.

B. PENNSYLVANIA STATE UNIVERSITY

A feature here had been the use of closed-circuit television for teaching large classes. Members of the staff found it impossible to define in categorical terms the process of teaching by television. Success as a television teacher appeared to them to be the product of a number of abilities and qualities rather than the result of any prescribed techniques. The basic requirements seemed to be:

(i) Effectiveness as a teacher in the conventional classroom situation.
(ii) An honest desire to take advantage of the use of television.
(iii) A warmth or dynamic quality enabling the teacher to maintain contact with the student.
(iv) Imagination.
(v) A willingness to plan and prepare throughly in advance.

Taken together these qualities would help to achieve the primary objective of effective communication.

In the context of the work being undertaken at Pennsylvania State University there were two basic reasons why the use of studio audiences generally was not adopted:

(i) The presence of students results in a division of the instructor's attention. They found that the instructor invariably devoted an increasing amount of his attention to the face-to-face group and less to the viewing students, so that the latter became isolated, passive observers. Without a studio audience the instructor teaches directly through the eye of the camera.
(ii) The presence of students limits the extent to which television can be utilised and exploited as an instructional tool. One of television's chief assets is to provide each student with a front seat. Anything which will hinder full mobility of the cameras

will detract from the value of the instruction. Furthermore, students are distracted by the movement of equipment.

Generally, then, it does not seem advisable to mix the two teaching situations—teaching by television and conventional classroom teaching.

Television not only demanded new techniques for the teacher, it also provided a new experience for the student. It was found desirable to give students an orientation course of reasons for the use of television instruction "to help break down the stereotyped reaction to so-called mass education and the traditional belief that the smaller the class, the better the instruction." (Greenhill.)

C. HAGERSTOWN, MARYLAND

Mr. Richardson showed considerable interest in the large closed-circuit system at Hagerstown involving nearly fifty classes, and about 19,000 pupils, the use of 115 miles of cable and the presentation of about 125 television lessons per week. Some teachers are employed at the Television Centre full-time and students from Hagerstown Junior College devote part-time "on the job" training to television operation. At College they are engaged on communication courses and part of their instruction includes practical experience in the operation of television. Other features of the system were the full use of visual devices such as electrically operated roller blackboards, the distribution of teaching notes to the schools, and the Summer Workshop held annually with television teachers and classroom teachers to plan courses.

The television staff of the Board of Education of Washington County insist that the use of closed-circuit is only an aid to teaching. A television teacher insisted that he was only supplementing the work of the class teacher upon whose attitude towards television a great deal depends.

It was observed that many of the programmes were well prepared, but the teaching was impaired by too great an attention to the script, resulting on occasions in a carefully rehearsed talk being presented too rapidly in a monotone. The most successful programmes were those where the teacher brought to the television camera and microphone his own well tried mode of exposition. Other programmes, such as those in biology, proved successful because the television teacher had called upon resources not normally available to class teachers. One of the staff said that in his view there was no simple answer to what educational television can do. It should be regarded as an additional kind of learning experience. It was emphasised that face-to-face relationships between teachers and pupils are important and should occupy most of the school day. However, schools should endeavour to establish skills in self learning. Television lessons, occupying a small part of the day, provide a well planned experience in which pupils are, to a certain extent, put on their own responsibility. In time they gain sufficient experience to know that if they do not listen they will miss information which will not be repeated. There had been some concentration on courses for gifted students in small schools; the number participating would normally be too small for such a course to be organised but, by sharing with other schools in a television programme, it had become possible.

The Hagerstown method was to bring pupils together in large groups for parts of their lessons by television and in small groups, in face-to-face situations, for the other part of their work. This combination of large and small groups uses fewer teachers than under normal arrangements. Further, in the television lesson pupils reacted to the instruction as individuals and enjoyed opportunities they did not have before. Teaching by television resulted in more independent study. On the television screen the pupil sees what the teacher wants him to see and nothing else.

It was felt that progress still had to be made in the co-ordination of television with other important resources for teaching and learning such as text books. It had to be seen as making a contribution to learning and not just as an opportunity for putting on a show.

D. PHILADELPHIA

A weekly pupil audience of 206,000 in Philadelphia schools viewed television teaching material daily on time donated by a commercial station. Reports state that television teaching in large classes is successful where it is planned to meet a need. Large class assignments permit the more economical use of personnel and classroom space to the benefit of the entire school.

The success of television teaching depends upon the attitude, the skill and the imagination of classroom teachers in organising, in providing for individual differences and in making homework assignments. Well prepared teacher-guides and pupil work-sheets for use in the television classes were considered to be valuable teaching aids.

It was found that children remember with surprising accuracy the material presented on television and that they want to know more of the meanings, spelling and pronunciation of words they hear on the programme.

Librarians and teachers report that many children are stimulated to seek out reading material on the subjects or stories presented.

New techniques and procedures seen on television were rapidly brought into general practice.

In-service courses for teachers had been very successful.

Less able pupils were reported as acquiring through television facts and skills they could not obtain through reading and which they were not interested in acquiring in any other way.

The teaching of a foreign language in the elementary Schools had aroused the enthusiasm of pupils, parents and teachers.

At the end of five years television teaching, reports and standardised tests indicated that the majority of pupils learn as effectively by television in large classes as in standard classes. Learning and teaching improved as pupils became accustomed to the large class and teachers acquired self-confidence. Television will not supplant teachers; classroom teachers are an integral and important part of the plan and they determine to a large extent the quality of learning. Large class teaching released some teachers to work with smaller groups of advanced pupils and to do remedial work with slow pupils. Pupils learned to take notes and to list questions during the lesson to be asked later. Contrary to expectations discipline problems did not arise.

Quick and accurate testing procedures were devised by teachers. Essay type testing, in addition to quick testing devices, were advocated. Teachers preferred three television lessons in large classes and two follow-up periods for testing, answering questions and practical work in smaller classes. Radio-Television "Workshops" were conducted for teachers responsible for handling large classes, thus affording regular opportunities for discussion and planning.

Television is not a "cheap" form of education. It is an effective teaching device, which must be evaluated in terms of cost for the quality of services rendered.

E. HUNTER COLLEGE, NEW YORK

A report by the College in 1960, and summarised by the New York Times, states—

(i) By using closed-circuit television, large groups of student teachers are able to watch a lesson proceeding in the normal classroom atmosphere. There is no limit to the amount of this observation (as there would be if visitors were actually in the classroom) and it is possible to have simultaneous comment or question by the student supervisor.

(ii) Such lessons could be recorded and used regularly for teacher training. The contribution of particularly good teachers could then be made without limitations being imposed by the School time-table.

(iii) Recordings could be used as a method of estimating the progress of student teachers. The Supervisor and student could "play back" the recording and discuss the lesson while the student watches himself in action.

(iv) Prepared recordings could become an integral part of the College course on Teaching Methods.

The technical advantages are obvious. There may be hidden benefits which may be more important. Dr. Brish (Hagerstown) maintains that television teaching gives teachers (whether actually teaching on television or viewing) "a point of comparison. It permits them for the first time to watch colleagues at work. It ends isolation and permits the kind of critical analysis which alone can keep a profession alive."

The cameras used in Hunter College were small and the children appeared to ignore them entirely. The picture was extremely clear and it was easily possible to "zoom in" for close up views of individual children. No child appeared to look at the camera. Members of the School teaching staff appeared to be unaffected and accepted the fact that they were giving "observation" lessons as a normal part of their day's work.

Mr. Richardson's Conclusions. "That the onlooker sees more of the game may be true—providing he sees the whole match. In a comparatively short visit such as I made it is all too easy to make facile generalisations which will not bear detailed analytical examination.

Nevertheless, there were some aspects of Educational Television and certain findings, as expressed by those concerned with its use, which occurred often enough to create a considerable impression.

The real impetus to Educational Television in the United States was given in 1952 when the Federal Communications Commission decided to reserve 242 channels for non-profit educational broadcasting. About one fifth of these have been taken up and it can be said that, although there is still much to be learned about techniques, Educational Television has gone beyond the purely experimental stage. It is, to quote Maloney & Donner (from Educational Television—the next ten years) "in potential, at least an exceedingly useful instrument for improving American Education and for meeting increasing demands on the educational system in a reasonably economical way." They see the principal use of Educational Television, in the immediate future, as a supplement and reinforcement of conventional classroom teaching.

I was impressed by the quantity and quality of the equipment used (in both open and closed-circuit) at the source of the programmes I saw and by the ability and skill of the operators. 'Technical hitches' were very rare.

In closed-circuit, the programmes originated from a studio, and the only instance of cameras being used in the classroom was at Hunter College, where there was a particular reason for doing so.

A great deal of thought was being given to the technique of presenting information in visual form and there was evidence of real ingenuity in this field of work.

The television teachers and operators were all extremely enthusiastic—one might say almost dedicated to their work—and were wholly convinced of its value. Almost all added the proviso that the studio teacher alone cannot achieve the desired results. The Educational Television programmes, they said, must be supplemented by classroom learning situations and co-ordinated with the other experience of the School day.

At the receiving end—some elementary school teachers leaned very heavily on Educational Television to bolster their own knowledge. It was noticeable that Educational Television resources were used less in High Schools, where there seemed to be more conservatism towards utilising this medium of communication.

I have remarked earlier about the constant note taking by the pupils. This worried me, and I felt there was some connection here with the undoubted superficiality of some of the programmes. The efficacy of the immediate follow-up by class teachers varied between wide limits. This is inevitable in large systems, but it gives the impression that there has been rather too much emphasis on quantity, as opposed to quality—at least at School level.

As might be expected, there has been among educators considerable opposition to the development of Educational Television in the United States. This situation can be paralleled in our own country. Apart from conservatism and inertia, objections are made to the nature of the learning process, to the passivity of the learners, the absence of personal relationships (such as are endemic in face-to-face teaching), and the fear that the initiative is being taken away from the class teacher or, indeed, that it may lead to his replacement by this new teaching device.

In spite of this, the growth of Educational Television in the United States has been phenomenal.

Many educationists are of the opinion that Educational Television will play an increasingly important part in coping with the problems created by vast increases in the student population."

PART I. CHAPTER 2.

PHASE II.—NOVEMBER, 1963 to JULY, 1964

1. The aim of Phase II of the Experiment was to discover how the work begun in the classroom could be extended under Studio conditions.

The untimely death of Mr. G. A. Richardson, the Headmaster of Warblington School, deprived the Experiment of his creative initiative, encouragement and advice that had proved so valuable in the early stages.

With the growing demands of the Experiment, the Hampshire Education Committee relieved the Television Teacher of other school duties and appointed him Head of Television Studies to run the well-equipped Studio under the general supervision of the new Headmaster, Mr. E. J. Rankin.

2. At this stage, Southern Television Limited continued to provide technical assistance. Practising teachers performed the remaining tasks. All rehearsal and design work was undertaken after School. No secretary or technician had at this time been appointed. Interested teachers undertook specific tasks such as design, film and carpentry. The camera work was undertaken throughout the rest of the Experiment by Miss P. Chapman, a full-time teacher who was released from other school duties on occasions to attend transmissions. This shortage of Studio staff was accepted under experimental conditions but it was clear that the Studio could not function regularly and efficiently without a full complement of skilled personnel. The situation was eased by the appointment of secretarial help later in Phase II.

The Head of Television Studies had embarked on Phase I with no prior knowledge of television equipment or procedures. With study and practice and with the continued advice of Southern Television Limited an understanding of the problem slowly grew. The Studio presented a new challenge. It was some time before full and confident use could be made of the Control Room facilities. The need for training was evident.

Some progress was being made by November 1963, when the preparation of teaching material began.

3. It was planned to extend the Mathematics Course of Phase I. The aim was to use visual material and captions specially prepared for Studio conditions. Vision and sound switching would continue to be operated by the teacher. This meant that the Control Room facilities were to be made available also on the Studio Floor. Technically the problem was tackled by constructing a remote control panel. Viewing teachers considered the result of the use of this panel effective. The television teacher appeared to be able to time all the operations of caption changing, vision switching and camera adjustment satisfactorily. This apparent command of the situation was, in fact, illusory. From the television teacher's point of view it was not easy to divide his attention between teaching and the operation of equipment. The help of a technician was seen to be necessary. No teacher who had not had the opportunity of many hours practice with the equipment could even begin to work in this way. It was necessary for the teacher to concentrate on his material and be relieved of all responsibility for the control of apparatus. What had been possible to a limited degree in the two-classroom situation was not acceptable in a Studio. The work was now in a new dimension. Television teaching from a Studio is essentially a team exercise.

4. The scope of the Experiment now widened. It was necessary to investigate new subject areas and increase the number of teachers participating in the Experiment. Subject details are set down in Section 8. By July 1964 over one hundred staff, student teachers and visitors had participated in the work of the Studio. Of these, thirty were practising teachers. Programmes of both enrichment and curriculum type teaching were presented. Most of the programmes were received only by Warblington School. More Studio secretarial help was necessary if programme information was to be readily available in the linked schools. In the work of Phase II generally it was discovered what could and what could not be done from the teaching, administrative and technical points of view.

5. An additional and interesting feature of the work was that undertaken with the Portsmouth College of Education. Five groups of students made regular visits to the Studio over a period of six weeks. A scheme of work was devised to introduce the students to the technique of television teaching. On the second visit each group drew up ideas for English programmes. After discussion a topic was agreed for each group and up to six students chosen for the presentation of each programme. Camera work, caption changing and the design of visual material was undertaken by the other students. All groups subjected themselves to rehearsal disciplines, often returning to the Studio in their own time to go over a particularly difficult section. By the end of the time available three programmes were ready for transmission. The exercise was a valuable experience for all concerned. As this was a first attempt, difficulties arose which would be avoided on later occasions. It proved difficult to find times when both students and Studio could be available. An intensive course would have been more valuable than weekly visits. Responsibility was divided between the Studio Director and the College Lecturer. It was noted, as with other aspects of the Experiment, that the Studio could operate efficiently either as an independent unit or when operating within an autonomous institution. Experience gained elsewhere suggests that a College of Education can more easily integrate television study into its curriculum when it has its own Studio facilities. This work was only a part of the Experiment and it was not always possible to allocate the time and the design and technical facilities that the Students' Course required. However, it was found that much could be learnt about a student's potential and performance under the exacting conditions of a television Studio.

In general, the Students' Course was considered to be a development of considerable significance. The programmes prepared were well received in the classroom by pupils and teachers alike. Given adequate studio facilities, and staff professionally well equipped to undertake this specialised work, television study, and practice in the techniques of television teaching, can play an important role in the training of the modern teacher.

6. No extensive use was made of the class observation facilities. Student teachers were mostly disappointed that individual children could not be studied. The equipment was not designed to do this and, in any case, it was considered useful for students to have the opportunity to observe general classroom procedures. It should be reported, however, that the observing groups did not consider the picture quality to be adequate and were, in general, unenthusiastic towards this use of the equipment. The degree, if any, to which this attitude was the result of prejudice against new media must be a matter of conjecture.

7. Senior pupils were used in the Studio for simple camera work and to change captions. It was considered that the pupils who would benefit most from this work would be those of the VIth Form who had been accepted for training at Colleges of Education. Other pupils were also used. The experience for the pupils was useful and the work was done well but, on balance, the arrangement was unsatisfactory. It interrupted the pupils' curriculum studies and took too much of their time. It was impossible to have a sufficient number of pupils available to meet the full requirements of the Studio. It was a worthwhile educational exercise but experience showed that it could not be efficiently organised with all the activities of a busy school.

8. Outline of Programme Material presented.

(1) MATHEMATICS
  (a) Conventional Curriculum material:
    (i) Collecting like terms
    (ii) Directed numbers
    (iii) Solution of equations
    (iv) The Circle.

- (b) 'Modern' Mathematics:
  - (i) Mathematical ideas (seniors).
  - (ii) Topology (extension of the work in Phase I).
  - (iii) The Arithmetic of the Computer.

(2) HISTORY OF ART
- (a) Prehistoric Art—the Altamira Cave Paintings.
- (b) Egyptian Frescoes.
- (c) Mosaics.

(3) CAREERS

Opportunities for school leavers in S.E. Hampshire—supplementary to the B.B.C. series.

(4) MUSIC
- (a) A study of Bach—three experimental sessions not on transmission.
- (b) A study of Haydn.

(5) DOMESTIC SCIENCE

A series of television inserts dealing with cake icing and interspersed with practical work by pupils.

(6) DISCUSSIONS—'It's my Opinion' Series:
- (a) Literature—the Novel Today.
- (b) Art—The Role of the Artist—Art for Art's Sake.
- (c) The Role of the Church in Modern Society
  .... with the Revd. J. D. Lambert.
- (d) Religious and Ethical Discussions—three experimental sessions with senior classes trying two-way sound.
- (e) The Ethics of Journalism
  .... with A. Garrett, Esq., Editor of the "Hampshire County Press".
- (f) The nature of Responsibility—(I)
  .... with Chief Inspector L. A. G. Soper, Havant Police.
- (g) The Nature of Responsibility—(II)
  .... with the Headmaster of Warblington School.

(7) HISTORY

The Arts of Ancient Greece, with emphasis on pottery, sculpture and architecture.

(8) RE-TRANSMISSIONS OF SCHOOLS' BROADCASTS
- (a) B.B.C. 'Challenge' Series—Physical Education.
- (b) I.T.A.:—
  - (i) 'Crossroads' Series—Religious Education.
  - (ii) Careers.
  - (iii) French.

(9) VISITING SPEAKER

Dr. McArthur on Microscopes.

(10) ROAD SAFETY
.... with Havant Police—Cycle Maintenance.

(11) FRENCH
Tavor Audio Visual Method—continuation of First Year Course.

(12) ENGLISH
.... with students from the Portsmouth Training College.
(a) Darkness and Night.
(b) Conveying Information.
(c) Truth—the nature of accurate reporting.

(13) PHYSICAL EDUCATION
Transmissions of film loops during inclement weather.
(a) Cricket.
(b) Athletics.

(14) INFANT EDUCATION
.... in conjunction with staff and students of the Portsmouth Training College. An experimental programme for teachers and lecturers in South East Hampshire.
(a) Pre-number work.
(b) Vocabulary extension.
(c) Word building.
(d) The idea of a group.
(e) How musical sounds are made.

(15) DEMONSTRATION PROGRAMMES
(a) An Open Day for the National Press—a composite programme aiming to give a cross section of the work of the Experiment.
(b) A demonstration for local Head Teachers presenting a miscellany similar to Open Day.
(c) Demonstration for B.B.C. and Southern Television Outside Broadcast Units for the preparation of items for their Southern Region programmes.

9. **Summary.** In Phase II, it had been possible to increase the number of teachers undertaking television teaching, widen the range of subject material, present more elaborate programmes and arrange for student teachers to participate in the work.

PART I. CHAPTER 3.

PHASE III.—SEPTEMBER, 1964 to APRIL, 1965

1. The aim of Phase III was to subject aspects of the work to Objective Assessment. A further grant was made by Southern Television Limited and the Hampshire Education Committee provided additional funds for design materials. An educational psychologist, experienced in research work, was appointed to undertake the Objective Assessment, in close consultation with the National Foundation for Educational Research.

The work of assessment was based on a dual premise:—

(a) Objective Assessment by definition is confined to those matters that lend themselves to quantitative analysis. Questions of Studio organisation and equipment can be evaluated subjectively. Such qualitative evaluation of the Experiment would be undertaken in the light of the experience of those engaged in the work. The quantitative evaluation would be obtained by objective measurement and statistical analysis.

(b) For the purposes of the Objective Assessment the existence of closed-circuit television was taken as an accepted fact. The major question to be considered therefore related to the way in which it could most effectively be used. Any comparisons between the relevant merits of closed-circuit television as opposed to classroom teaching would only arise indirectly.

2. A Studio Technician was appointed. The help and advice of Southern Television continued. In January 1965 the regular weekly visits of Southern Television engineers ceased.

A regular maintenance schedule was introduced and a daily record kept of all technical work undertaken, itemised for each separate piece of equipment. The apparatus now operated more reliably and good audio and video signals were obtained. The few occasions when reception was inadequate were the result of faults in the distribution system. The amplifiers, particularly those installed in the remote schools, were unreliable.

It was not possible to call any of the linked schools directly on the Control Room microphone. The selector had first to be switched to talk-back at the receiving end. This was unsatisfactory. In the case of Warblington alone, it was possible for the Control Room to be linked directly with a classroom without cutting programme sound to any other room. This was only possible over the inter-school link at the instigation of the receiving school. Had it been possible for talk-back with the remote schools to have originated in the Control Room, teachers would have been helped to operate the two-way sound with more confidence.

3. The presentation of a series of programmes involved more than Studio preparation. Subject teachers from the three schools were invited to discuss programme arrangements. Teachers' Notes were prepared, describing programme details and making suggestions for follow-up work. Students' Handbooks were prepared for the Local History series. Detailed Worksheets were issued to pupils in the English, Music, and Mathematics series. These supplementary arrangements were extremely valuable and formed an integral part of programme planning. As much provision was made for them as time and facilities allowed.

4. The possibility of alleviating a specialist teacher shortage was investigated. In the Introduction to Trigonometry series, student teachers from the Portsmouth College of Education were selected to undertake the role of classroom teacher. These students were not Mathematics specialists. They were provided with Programme Notes in advance, and were responsible for class preparation and follow-up.

5. A feature of Phase III was the growing confidence displayed by the television teachers, who were now benefiting from their earlier experiences in Phase II. It was possible to reduce rehearsal time. In preparing the series on Music and that on the History of Art, two full rehearsals were still held, and the time formerly spent on improving elementary technique was now devoted to more elaborate presentation. Among the several examples of this were the programmes on Bartok and on Print Making, both of which were particularly well received. It is significant that both the teachers concerned had, by this time, become well versed in Studio procedures and in the technique of incorporating a variety of audio-visual devices to illustrate their exposition. Other teachers obtained similar results. There is no doubt that, given adequate time, training and facilities, teachers can develop their special talents for effective use on the television screen.

6. Phase III—Outline of Programme Material Presented

(1) MATHEMATICS
- (a) Binary Arithmetic—series of 3.
- (b) Elementary Algebra—series of 3.
- (c) Introduction to Trigonometry—series of 5.

(2) ENGLISH
- (a) "On Fish"—to encourage intensive writing.
- (b) "Fear and Joy"—a study of contrasting feelings and emotions.
- (c) "The Shape of a Story"—an introduction to the features of narrative writing.

(3) MUSIC
- (a) Instrumental Instruction—the violin.
- (b) Setting Words to Music—I.

  - (c) Setting Words to Music—II—application to the 4-line stanza.
  - (d) The Role of the Conductor—interpretation, "time-beating", texture, the Conductor in Action.
  - (e) A Study of Bartok—the man, his career, his style and the significance of his Folk Music.
  - (f) The Study of Musical Form—an analysis of the Fugue.

(4) HISTORY OF ART
  - (a) Prehistoric Art.
  - (b) Egyptian Frescoes.
  - (c) Mosaics
  - (d) Print Making.

(5) LOCAL HISTORY
  - (a) A Study of Local Buildings.
  - (b) The Basis of Local Settlement.

(6) SOCIAL STUDIES
  - (a) "Careers in South East Hampshire"
    .... a study of the local employment situation with comment from the local Youth Employment Officer, a discussion with a local employer on the personal qualities sought for in a good employee and comment on their first jobs by young people who have recently started work.
  - (b) The Interview—an exercise for prospective employees.

(7) ARCHITECTURE
  "Looking and Seeing"—a study of the features of local Saxon and Norman churches.

(8) ROAD SAFETY—in conjunction with the Havant Police
  - (a) Cycle Maintenance.
  - (b) Cycling and Safety First (telecine).
  - (c) Local Accident Blackspots.

(9) RELIGIOUS EDUCATION
  - (a) "What is Charity?"
    - (i) A discussion with a clergyman on the basis of human relationships.
    - (ii) A discussion with the secretary of a public Charity on giving money, time and talents.
    - (iii) A discussion with a local headmaster on relationships between the sexes.
  - (b) "How Free Am I?"
    - (i) A discussion between a Clergyman and a Psychiatric Social Worker to investigate:
      - (a) the pressures that society put upon people and
      - (b) the reaction of the individual to these social pressures.
    - (ii) Follow-up discussion of questions sent in by students.

(iii) A discussion between a Clergyman and a Psychiatric Social Worker to investigate the role of the organisations devoted to Social Welfare in the local community.

(iv) A discussion on Mental Health between a Clergyman, a Psychiatric Social Worker and a practising Psychiatrist.

(10) TAVOR FRENCH

(11) RE-TRANSMISSIONS (a) B.B.C. Series for School-leavers.
(b) I.T.V. Notre Ville series.

7. Analysis of Programmes. Presented during the period of Objective Assessment, October 1964 to April 1965. (Warblington School only.)

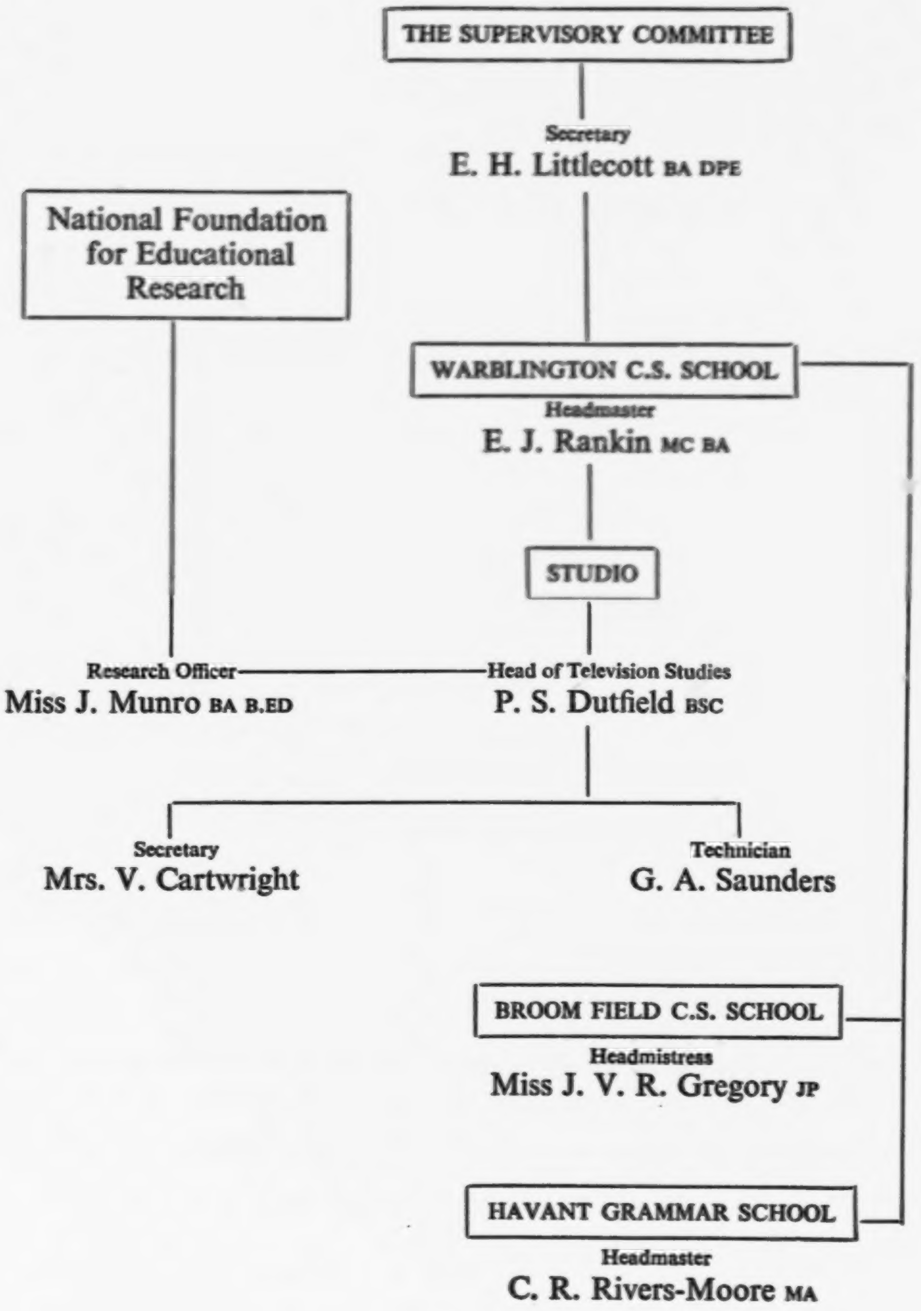
Week Ending	*Teaching Periods*	*Live*	*BBC/ ITA*	*French*	*Control Group*	*Totals*
1964						
23 Oct.	35	3	2	4	4	13
30 „	35	4	2	2	3	11
6 Nov.	21	1	2	—	2	5
13 „	35	2	3	2	1	8
20 „	35	4	3	4	2	13
27 „	35	3	3	2	1	9
4 Dec.	35	2	3	1	2	8
11 „	28	4	—	1	—	5
18 „	28	1	—	—	—	1
1965						
22 Jan.	35	1	2	6	—	9
29 „	28	1	2	5	—	8
5 Feb.	35	3	2	4	—	9
12 „	35	2	2	5	—	9
19 „	35	1	2	4	—	7
26 „	28	1	1	—	—	2
5 Mar.	28	1	1	4	—	6
12 „	35	3	2	5	—	10
19 „	35	—	2	2	—	4
26 „	35	2	2	3	—	7
2 Apr.	35	2	2	1	—	5
9 „	28	1	—	—	—	1
Totals	693	42	38	55	15	150

During this time there were 693 teaching periods, of which the Experiment was concerned in 150, i.e. $\simeq \frac{2}{9}$ of potential teaching time.

N.B. cf., Phase II figures—December 1963 to July 1964:—

Live	*BBC/ ITA*	*French*	*Total*
35	30	28	93

8. Administrative Schema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Miss J. V. R. Gregory JP
HAVANT GRAMMAR SCHOOL
Headmaster
C. R. Rivers-Moore MA

PART I. CHAPTER 4.

TECHNICAL ARRANGEMENTS

Introduction. In the summer of 1963, the Chief Engineer of Southern Television Limited, in co-operation with the County Architect, Hampshire County Council, and in consultation with those engaged in television work at Warblington School, designed the Studio. For speed of erection, a Terrapin building was chosen and was modified internally to suit the television requirements. Completed in the Autumn of 1963, the building contained a floor space of 32 ft x 24 ft. This area was divided between a Studio floor of 24 ft. square, a preparation room and a well equipped control room separated from the Studio floor by an extending Marley door.

1. The Studio Floor. The Terrapin building has large windows on two sides. Daylight was excluded by the use of floor-length grey curtains lined with black which had additional acoustical advantages as well as providing a useful backdrop. A conventional type classroom blackboard was fixed to the end wall but was to play a diminishing role in the Studio work. A movable demonstration bench and a fixed bench with water, gas and electricity points were installed. Ventilation was provided by the installation of extractor fans, although these were to prove inadequate to the task. Supplementary heating was provided by the use of infra-red overhead heaters. These were chosen simply to accord with the design of the building and were not necessary once transmissions were under way. Facility boxes were provided at selected points around the walls to enable more flexible use of microphones, floor monitors and the remote control panel. This panel was intended to provide the facility for vision and sound switching to be controlled from the Studio floor thus enabling the teacher responsible for the work to undertake television teaching without an additional person in the room.

The two Vidicon cameras used in Phase I were adapted for use in the Studio, providing one viewfinder and one remote control camera, in each case dolly-mounted. A talkback system was provided so that the camera operators could receive instructions from the programme director. A Studio loudspeaker enabled the programme director to communicate with the Studio floor as a whole during rehearsal times.

The lighting comprised ordinary house lights not used during transmissions, 12 fluorescent strips and 8 variable spots, all independently switched from a panel in the control room and supplemented by two 500 watt portable floods. These lighting facilities were to prove reasonably adequate to the task. Had the ceiling been 10 ft to 12 ft. high instead of 8 ft., this would have permitted the use of wider angle lenses and operation would have been simplified.

Even so, the lighting was a great advance on classroom conditions. The feature of the Studio floor was the flexibility that the space provided.

2. The Preparation Room. This was installed with the intention of providing facilities for the construction and preparation of visual material. Work bench, water, gas and electricity points and adequate heating and lighting were provided. The output of the Studio was soon to outgrow these facilities and before long, most preparation work was done in other buildings.

3. The Control Room. The features of the control room were flexibility and reliability. At the same time, it had to be recognised that technical assistance would not compare with that found in professional studios. The control room was designed to be operated by one man assisted by a technician. This was achieved by incorporating vision switching and sound mixing, camera and lighting controls all within easy reach of the central control desk. A preview monitor sufficed for all picture sources.

A. VISION SWITCHING

A preview vision switching bank enabled any picture to be selected on preview. Across this preview monitor was wired an oscilloscope to check the picture waveform and level. When the picture was acceptable from the technical as well as from the programme point of view, it would be selected for transmission on the output monitor in the Control Room and on the Floor monitor in the Studio.

B. SOUND MIXING

The sound sources which could be mixed from the control panel comprised microphone 1, microphone 2, grams, tape and telecine. The gram and tape decks were within easy reach, but usually required a second pair of hands to operate.

C. TELECINE

Telecine was provided and comprised a Bell & Howell 625 projector optically coupled to a Murphy Industrial Vidicon camera. Because of the sensitivity of the camera, the projection lamp in the projector was replaced by a lamp which had an input of approximately 200 watts compared with the 1000 watt lamp with which the projector was originally provided. Both the camera and the projector were equipped with lenses which were set on infinity focussing. Further, whilst the projector ran at a nominal 24 f.p.s., the camera was triggered in a random fashion and gave approximately 25 f.p.s. Because of the storage characteristics of the Vidicon, the conversion from approxi-24 f.p.s. to approximately 25 f.p.s. was accomplished with very little resultant flicker. The camera used has automatic target control and is therefore well adapted to handle the different light levels experienced on film. Some difficulty had been experienced in setting the sound levels as between magnetic sound track and optical sound track. This shortcoming was overcome with the appointment of a technician whose responsibility it now was to attend to such matters. It was not found necessary to incorporate field lenses or tunnels in order to achieve satisfactory picture contrast. In general, the telecine equipment worked very satisfactorily.

D. TWO-WAY SOUND

A switching panel provided flexible sound facilities. By selecting various combinations of this six-switch bank the following could be effected:—

(i) Transmission sound from Studio Floor to receiving classrooms in each of three buildings.
(ii) Reverse of (i).
(iii) Sound from control room to any of the receiving classrooms without cutting programme line to other rooms. In the case of the linked schools also, programme sound is not interrupted because a separate control line is provided.
(iv) Sound from any of the receiving points to the control room.
(v) Loudspeaker talkback between control room and Studio Floor.
(vi) Sound from control room to camera operators' headphones.

4. Camera Specifications.

Camera 1.—Dage 320 B/U with electronic viewfinder.
Camera 2.—Dage 70 B. Remotely controlled turret and focussing.
Camera 3.—Telecine Murphy T.V.C. 761 Vidicon camera coupled to B. & H. 625 16 mm. projector.
Camera 4.—Murphy T.V.C. 761
Camera 5.—Murphy T.V.C. 761.

All the above operating on 625 lines.

5. The Teacher Training Apparatus. One room in Warblington school was selected for the installation of observation equipment to enable visiting training college students to view the procedures of an ordinary classroom without the situation becoming artificial by their physical presence.

The two industrial cameras (Cameras 4 and 5) were installed: one was mounted on the rear wall, giving a general view of the teacher from the back of the class; the other camera was directed on the class from the front of the room, giving an angled shot of approximately half the number of pupils. Neither of these cameras showed details in close-up, but they were perfectly adequate, even in varying light conditions. Only the teacher knew when the cameras were operating. Pupils soon took the presence of such equipment for granted and, in any case, never knew when they were being observed. The cameras were switched on and off remotely.

A. THE SOUND ARRANGEMENTS

The same paraboloid microphone used for talkback with the Studio was connected for teacher-training purposes to another loudspeaker in the viewing room. Given a standard of diction expected from the pupils, any comment in the room, even casual asides, could be heard.

B. THE VIEWING ROOM

A nearby room was fitted out as a viewing room in connection with this apparatus. To avoid overcrowding the room with apparatus, the monitor used to receive programmes from the Studio could be re-connected directly to one of the observation cameras. A second monitor was linked directly with the other camera, providing simultaneously two pictures of the classroom. No vision switching was necessary, since no selection between cameras was made. The responsibility for such selection between the two monitors was left to the students, advised by their tutor. Thus the pictures made less of a programme than a visual insert into a lecturer's talk on classroom procedures.

The apparatus was simple to operate, unpretentious in its aims, but effective nevertheless.

6. The Link. The Studio was linked with three schools. In Warblington County Secondary School, four classrooms were wired with the talk-back facilities with the Studio described above. The Havant Grammar School and Broom Field County Secondary School were equipped with one monitor each. The programme was transmitted by cable on H.F. (carrier frequency approximately 5.5 megacycles) first to the Havant Grammar School, where both sound and vision signals were amplified for their own use. The signal was then fed to a further amplifier and on, by land-line, to the Broom Field County Secondary School, where it was amplified and terminated at the monitor. The cable extended for approximately three miles across the town, using ducts along the railway line, overhead poles and further small sections underground.

Provision was made for talkback to the control room on a separate control line. For the purpose of the Experiment, the installation was of a temporary nature and transmissions were interrupted by line breaks, avoidable in a permanent installation.

The line amplifiers installed were of a commercially available type and, in a permanent installation, should be replaced by high grade purpose amplifiers.

7. Equipment and Installation Costs.

	Studio	£	s.	d.	£	s.	d.
1	Dage 7OBR Camera	825	0	0			
1	320 BU Camera Channel and Cable	1467	14	0			
2	Tripods	110	0	0			
	Camera Cable	85	0	0			
2	50 mm. Lenses	112	0	0			
2	25 mm. Lenses	86	0	0			
2	12.5 mm. Lenses	126	0	0			
2	8½" Picture Monitors	200	0	0			
2	Skids for camera	85	0	0			
1	Murphy Industrial Vidicon Camera with 4" lens	210	13	5			
1	16 mm. Projector	300	0	0			
1	Record Reproducer	30	0	0			
1	Audio Tape Recorder	45	0	0			
1	Picture Monitor	90	0	0			
1	Audio Amplifier	10	5	0			
	Audio and Video Mixing and Switching Equipment	300	0	0			
	Lighting fittings	210	0	0			
1	Cooke-McArthur Microscope	71	4	0			
1	16 mm. Cine camera	93	0	0			
1	Tripod with Pan and Tilt head	8	10	0			
1	Exposure Meter	10	15	0			
					4476	1	5
	Classrooms A to C						
3	Picture Monitors	270	0	0			
3	Parabolic Reflectors and Microphones	34	10	0			
3	Sound Amplifiers	30	15	0			
					335	5	0
	Classroom D						
1	Murphy Industrial Vidicon Camera with 15 mm. lens	197	18	6			
1	Murphy Industrial Vidicon Camera with 1" lens	195	0	0			
2	Remote target control units	16	0	0			
2	23" Picture Monitors	180	0	0			
1	Parabolic Reflector and Microphone	11	10	0			
1	Sound Amplifier	10	5	0			
					610	13	6
	Carried forward:				5421	19	11

		£	s.	d.	£	s.	d.
	Brought forward:				5421	19	11
	Classroom at Havant Grammar School						
1	23" Picture Monitor	90	0	0			
1	Parabolic Reflector and Microphone	11	10	0			
2	Sound Amplifiers	20	10	0			
					122	0	0
	Classroom at Broom Field School						
1	23" Picture Monitor	90	0	0			
1	Parabolic Reflector and Microphone	11	10	0			
2	Sound Amplifiers	20	10	0			
					122	0	0
	Wired Relay between Schools				2000	0	0
	Installation				610	0	0
	GRAND TOTAL				£8275	19	11

PART I. CHAPTER 5.

EDUCATIONAL TELEVISION DESIGN

In the early stages of the Experiment, design had been largely a matter of trial and error, combining the demands of pedagogy with the ideas of the artist. With the confidence that grew with experience and with the advice of the Design Department of Southern Television Limited, particularly concerning materials, considerable progress was made in this field. The design aspects of the Television work of the last three years should make a significant contribution to thinking and practice.

The main burden of the research fell to the Art Department of Broom Field County Secondary School. This work was supplemented in Phase III by the Art Department of the Warblington County Secondary School. An interesting development here was the contribution of a small class of pupils specialising in Television Design. Starting in September, 1964, a team of eight boys have spent their entire Art lesson and much of their own time working on Television Design. They have had opportunities to take their work to the Studio and to see it under the cameras, noting for themselves errors that have been made and making the necessary corrections. They have also had the opportunity of discussing with the producer the requirements for programmes. The stage has now been reached where these boys are able to carry out the work themselves with only occasional advice from the Art teacher. They work well as a team and have learned much about lettering, spacing, tone values and of design in general.

The pupils have developed an interest in lettering and display work generally. They frequently comment on captions seen on open-circuit television. As stated above it was found necessary for the design team to be given the opportunity to discuss their work with the producer, to see it on the screen and, where possible, to see the transmission or rehearsal. If they merely carried out the work without seeing the results they missed the feeling of achievement and the excitement of being a part of the whole productions.

The three main types of visual material used in the teaching programmes were as follows:—

1. BACKDROPS
   - (a) Those containing information used in the programme, for example: the large maps used in "Local History" and "Careers in South East Hampshire" and the reproductions of wall paintings used in "Egyptian Frescoes".
   - (b) Those used simply to set the tone of the programme, e.g. the design used in "Mosaics".
2. CAPTIONS

   Black and grey 12″ × 9″ Tudor board and Letraset instant lettering were used. The size was chosen for convenience. It is the 4 : 3 ratio that is important.

3. THREE DIMENSIONAL VISUAL MATERIAL

For example: imitation cakes for the Domestic Science Icing demonstrations; plaster blocks to illustrate the preparation of stucco; movable rollers to illustrate the principle of the curve of Constant Breadth.

The 16 ft. x 8 ft. workshop space provided in the Studio proved inadequate. The need for a property store was soon felt as the standard of work improved. A Design Magazine Library would have been invaluable.

Money was made available for expenditure on film. Pressure of time prevented the full exploitation of this medium. It was only possible to make one short film suitable for insertion in a programme. The preparation of film inserts for educational purposes required skills which, early on, were not available. All concerned regretted that the use of film was not explored more fully. The preparation of telecine inserts in locally produced educational programmes might add considerably to the visual impact of such teaching material.

Sound design was confirmed as an essential factor in successful programme presentation during Phases II and III of the Experiment. Visual presentation in any form cannot be divorced from design. The children compared the presentation and design of school closed-circuit programmes with those produced by B.B.C. and Independent Television. Low standards of presentation were not acceptable from the School Studio. It was unequivocably accepted at an early stage of the Experiment that sound design must be an integral part of every programme transmitted. The Art Staff of two schools often found themselves fully extended, a situation far from satisfactory, but the only one possible under the experimental circumstances.

Programme presentation without setting is quite unacceptable in television teaching. Plain black, white or grey backgrounds are rarely successful. Apart from a lack of visual interest, such backgrounds can sometimes lead to picture distortion and fuzziness. Restraint must be exercised to prevent unnecessary visual material causing distraction. Even so, some form of setting, however simple must be contrived to break up an even background.

This setting, which may be termed "Studio background" was carefully considered in each transmission, but not developed or experimented with sufficiently, partly because detailed Art direction was rarely available. A teacher could not be spared from normal duties to give the time required for experiment, research and construction. However, in the Enrichment programmes the use of large mural type designs showed the value of Studio background and contributed greatly to the visual impact of the History of Art and Music series.

Caption Lay-out and Design

Most of this work was done by the Staff after school hours. Valuable experience was obtained and work of a high standard achieved. In the main, this work consisted of programme headings, visual aids, maps, chronological tables, architectural drawings, lettering and layout.

It was important that this visual material should set the mood and content of the programme, provide information and be fully comprehended during the short period that it appeared on the screen. These requirements led to a symbolic simplicity of approach and gave ample scope for creative graphic design.

The problems of suitable caption size, type faces for legibility, colour and acceptable tonal contrasts were worked on to such an extent that standards comparable with the professional channels were produced. Such standards could only be achieved by careful planning and adequate time for programme production: facilities rarely available during the Experiment.

Conclusions

1. Even the simplest Captions and Studio background are essential to any programme.

2. Studio background should be carefully considered for each programme and should, if possible, be in depth to provide shape and interest. The designer must have a complete understanding of tonal contrast. Studio background must be so planned and constructed to allow freedom of movement to performers, cameras, cables and lighting.

3. Design planning is essential for the successful production of any type of programme. The designer should work closely with the producer from the conception of the programme and be involved in every aspect of its growth until transmission. To produce a really successful programme, a team effort is needed. Producer, Director, Teacher, Designer, Technician, Cameraman and Lighting Expert must work and plan in harmony.

4. The designer has to provide a backing in sympathy with the style of the production and, while a specialist in his own field, he must be able to convey to the viewer the feelings of the producer. In this way, he can add weight and emphasis to the producer's conception of any particular theme.

5. It is desirable that a designer for Educational Television should be an expert in some field of creative activity. He must possess some knowledge of the technical processes involved, keep abreast of the contemporary developments in Graphic Design and layout, have some understanding of photographic processes and be able to

provide abstract and functional studio backgrounds. Above all, he should have the ability to interpret the needs of the producer and transform them into a visual experience for the viewer.

In general, then, 'the need for a contrived atmosphere in which to stage a programme will, it appears, always be an inescapable factor of television. Theatrical performance, entertainment and the dissemination of information have never lost a ritual element—they have always needed a style and this is equally true of television' (R. Levin).

Designing visual material for television teaching is a highly specialised operation. It is not enough to be an artist.

The successful designer of educational material must also be versed in the techniques of teaching. Such a combination of skills is rare.

PART I. CHAPTER 6.

THE OPERATION OF THE LINK

Since December 1963, the Studio has been linked with the Havant Grammar School, the Broom Field County Secondary School and the Warblington County Secondary School and its work began to take the form of local broadcasting. Four monitors were installed in separate rooms at Warblington, whereas the other schools each had one monitor. This gave a potential viewing audience of approximately 250; up to 170 pupils in Warblington and up to 40 in each of the other two schools.

The particular problems involved in the preparation of viable television material by local teachers were investigated.

The number of teachers taking part in the television Experiment increased from five in Phase I to thirty in Phase II. In addition, twenty training college students and twelve visitors took part on various occasions. The growing number of teachers versed in the technique of television teaching enabled the presentation of a variety of material, much with a distinctly local flavour.

Given the principle of regional as opposed to school-based teaching, the practical problems of disseminating such material amongst three traditionally independent institutions came under close review. These problems were basically technical and administrative. Typical examples were, technically, breaks in the land-line and, administratively, time-tabling and notice of programmes. The experimental nature of the project meant that mistakes would be made. Early administrative weaknesses were soon exposed. Just as Phase I of the Experiment was conducted with the minimum of interruption of school routine, so the Link was undertaken in the hope that the television teaching could be gradually introduced into the already full lives of the three schools.

In general, a new dimension was being introduced into local educational thinking and practice. The three Schools were, in fact, being asked to forgo a degree of their independence in respect of curriculum, time-tabling and staff deployment. In the subject areas, the Schools were asked to be no longer institution centred and their studies no longer class centred.

Working in the context of one school, it had been possible in Phase I to undertake the television work with efficiency. For example, reception equipment was switched on and test signals received at prearranged times. The movement of pupils could be speedily arranged. The television teacher could closely supervise the entire proceedings and personally ensure that all arrangements ran smoothly. Such arrangements in the limited field of a single school were unsuited to the new situation. On the one hand, the receiving schools properly required a reasonable notice of transmission times. This situation was eased with the appointment of a secretarial assistant. Even so, forward planning was sometimes difficult, since the Studio relied upon the work of teachers already fully stretched. On the other hand, the remote schools retained responsibility for reception arrangements. The Studio gave technical advice, but it was not always possible for reception in the three schools to be co-ordinated. The most fully planned transmissions were subject to time-tabling difficulties, technical failure and the human factor.

The two-way sound was seldom used over the Link. This was due to technical difficulties and also to the fact that teachers did not appear confident in the operation of the two-way sound equipment. Given the need for two-way sound, the conclusion is that either the equipment must be simplified or that teachers must be fully trained in its use.

It became clear that thought must be given to Studio organisation and reception procedures. Just as in the ordinary school situation, time-tabling and the human factors have to be carefully considered.

Even with the liaison possible in a local situation, more than one school cannot satisfactorily receive television programmes without some degree of local time-table standardisation which may, for other reasons, be undesirable. An additional complexity was the variation in lesson times within the school day. Even the closest co-operation of the Head Teachers could not always provide uniformity of subject time-tabling.

Conclusions

(1) In the circumstances of the Experiment, the operation of the Link was not a success principally for the following reasons:—

- (a) Technical breakdowns.
- (b) Difficulties of co-ordination of time-tables, necessitating very long term planning and alien to the tradition of independence in British schools. This refers to the inherent difficulty of the task and not to any lack of readiness to co-operate by the schools concerned.

(2) Teaching to linked schools by television could prove advantageous subject to the need for

- (a) central organisation, and
- (b) simple and reliable equipment.

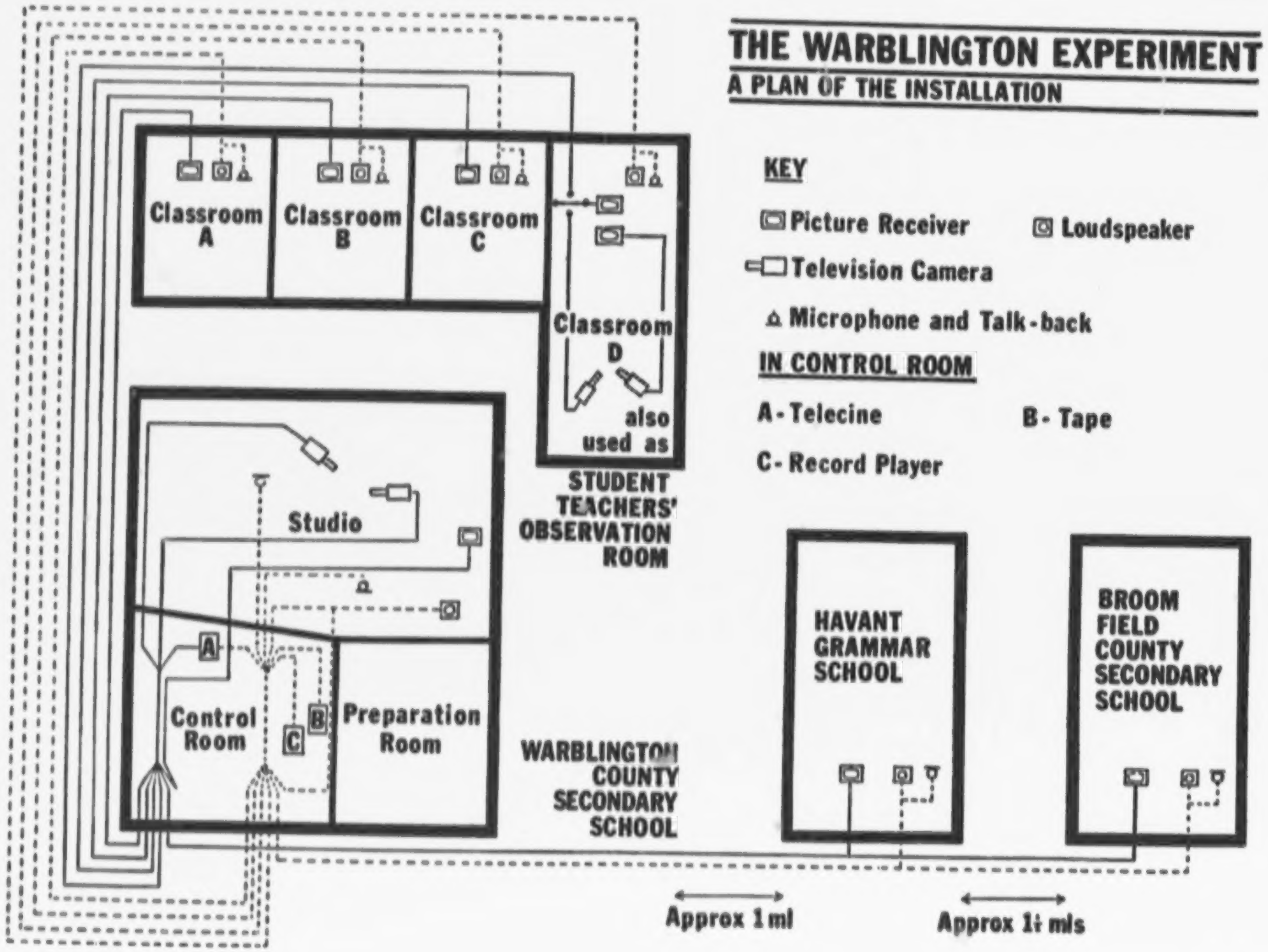
(3) It is easier for a school to accept occasional special interest or 'enrichment' programmes than to co-ordinate both time-tables and syllabuses sufficiently to share 'curriculum' teaching.

(4) In the circumstances of the Experiment, teaching over the Link did not provide any economy in the use of teacher or other resources. It would require reception facilities in many classrooms and probably many schools, before such economies could be achieved.

In general then, experimental conditions, particularly from the staffing and technical points of view, did not make for a successful operation of the Link. The linking of a small number of schools seems undesirable. It is a question of scale. If television is extended beyond a single school it should encompass a large number of buildings, each containing several monitors. Any installation between these extremes is not worthwhile.

THE WARBLINGTON EXPERIMENT

A PLAN OF THE INSTALLATION


KEY
Picture Receiver
Loudspeaker
Television Camera
Microphone and Talk-back
IN CONTROL ROOM
A - Telecine
B - Tape
C - Record Player
Classroom A
Classroom B
Classroom C
Classroom D
also used as STUDENT TEACHERS' OBSERVATION ROOM
Studio
Control Room
Preparation Room
A
B
C
WARBLINGTON COUNTY SECONDARY SCHOOL
HAVANT GRAMMAR SCHOOL
BROOM FIELD COUNTY SECONDARY SCHOOL
Approx 1 ml
Approx 1½ mls

This plan is not to scale. The Preparation Room is fitted with a working bench and shelves. The studio has a mobile demonstration bench and a fixed bench with water, gas and electricity points. There is a glass viewing panel between the Control Room and the Studio.

PART I. CHAPTER 7.

FINDINGS

Introduction

1. The aim of Part I of the Report is to set down the detailed results of three years' investigation into the use of closed-circuit television in schools.

2. The evidence for these Findings is set out in the body of the Report.

3. The Findings are detailed under the following headings:—

A. Closed-circuit television in one classroom.
B. " " linking two classrooms.
C. " " linking a small number of schools.
D. " " using a Studio.
E. " " and the preparation of teaching material in a Studio.
F. " " used for Teacher Training.
G. " " linking a large number of schools.

SECTION A. CLOSED-CIRCUIT TELEVISION WITHIN ONE CLASSROOM

1. Television cameras can be used effectively within one classroom or laboratory for the magnification of detailed processes.
2. The equipment should be kept simple.
3. A small industrial type camera is satisfactory.
4. The use of more than one camera with vision switching increases the complexity of the system considerably and is not recommended.
5. The single camera can feed one or more monitors as required.
6. The camera should be tripod or clamp mounted. Dolly mounting in this situation is not essential.
7. Even the simplest apparatus must be regularly maintained.
8. A technician is best qualified to undertake the setting up, operation and maintenance of equipment.
9. A teacher is best qualified to supervise the use to which the equipment is put.
10. A stock of technical spares is essential.
11. An oscilloscope, which is valuable to check picture waveform, can be obtained relatively cheaply and is simple to operate.
12. A separate preview monitor is not required in this situation; the picture monitor will suffice.
13. A lens turret is not necessary.
14. A zoom lens is necessary.
15. A microscope attachment is a simple and effective means of showing microscope slides on the screen.

16. Reliability is enhanced when all the equipment is in regular use.
17. The critical time is the warm-up period.
18. The warm-up period of cameras and monitors is a variable factor determined by experience.
19. Unskilled manipulation of monitor controls is inadvisable. The procedure for picture adjustment of monitor sets can easily be mastered. Advice is readily obtained from the manufacturers and from technical literature.
20. The size of monitor screen is a function of the size of room, the number of viewing students and the number of monitor screens used.
21. A 23" screen is adequate for a viewing audience of up to 35.
22. The use of more than one monitor can be advantageous.
23. Seating arrangements depend upon:
    (a) The needs of the particular lesson.
    (b) Angle of the screen.
    (c) Distance of students from the screen.
    (d) Reflection on screen of room illumination.
24. Lighting influences both camera and screen.
25. Irregular variations in daylight should be reduced.
26. Automatic target on the camera will not completely offset changing light levels.
27. Venetian type sunblinds reduce the effect of light variations, and the reflections on monitor screens.
28. The safety of both child and equipment must always be considered. Trailing cables and wall mounted video links are particular sources of danger.
29. Television wiring is best incorporated in new buildings at the time of construction.
30. Where portable equipment is used, and the video-signal fed to monitors by way of wall mounted facility boxes, the greatest care needs to be exercised to ensure that all equipment is at all times completely child proof.
31. Teaching procedures are not affected in any new way.
32. Care must be exercised, as is customary with other visual aids, to ensure that the use of the device is a positive aid and does not intrude upon the lesson.
33. As with other material, the required magnified illustration should be ready for presentation at the appropriate moment in the lesson.
34. Camera shots should be prepared in advance.
35. In the room situation pupils are not watching a television programme. The monitor screen is simply a wall chart and a magnifying glass and the teacher should use it as such.
36. If the small scale of the work does not warrant the appointment

of a technician, it is within the capacity of the teacher to operate a simple camera chain.

37. The television camera can take its place with other visual devices in assisting the teacher in his real task, which is not to operate gadgets but to teach children.

SECTION B. CLOSED-CIRCUIT TELEVISION LINKING TWO CLASSROOMS

1. Two classrooms can be linked by television.
2. The technical findings already set out in Section A. 7-11 inclusive and A. 16-30 inclusive apply equally to this situation.
3. Two cameras are adequate.
4. One should be a viewfinder camera dolly-mounted with a lens turret. A camera operator is then required.
5. The second camera should be of a small industrial type and confined to visual material.
6. Picture preview is necessary, and obtained by using small camera monitors.
7. A 23" screen can be so placed to provide a transmission picture for the teacher and for the camera operator, and a supplementary picture for those of the 'live' audience whose view is interrupted by the equipment.
8. With both equipment and pupils in the transmitting room, congestion and distraction occurs. This must be minimised.
9. The camera control units should be simple and compact.
10. A vision switching panel incorporating a two-way sound switch should be operated by the teacher. Confident and unobtrusive use of this panel soon comes with experience.
11. Lighting must be carefully considered.
12. Daylight conditions in a north facing room are acceptable, though still on occasions hazardous.
13. The establishment of a constant light level by any available means is preferable.
14. Two 500 watt portable floods can usefully supplement lighting.
15. A useful relationship with the remote pupils can be established with a confident use of the two-way sound.
16. In a 30 ft. by 24 ft. receiving classroom a paraboloid microphone enables speech from any of the pupils to be heard.
17. Pupils in the receiving room should enunciate clearly. The key is clarity rather than volume. The standard of diction should be that properly expected of pupils by their teachers.
18. The television teacher should work against an uncluttered background.
19. The blackboard can be used with care.
20. Long wall blackboards should be divided into sections, the

camera covering each section in turn from left to right.

21. The blackboard surface should be smooth, matt and genuinely black. The condition of the average classroom board is not acceptable.
22. White chalk is satisfactory. The dust-proof type is preferable.
23. Blackboard cleaning during transmission should be avoided. The resultant surface is patchy and grey.
24. Cleaning the board in the classroom can give pupils a time for re-alignment. This is better achieved in television teaching by the use of captions.
25. The teacher's microphone should have a trailing lead to permit freedom of movement.
26. The length of a televised lesson is a function of:—
    (a) the ability range of the pupils,
    (b) the expository style of the teacher,
    (c) the nature of the lesson material.
27. Mathematics lessons of up to 40 minutes, containing time for exercises and questions can successfully be presented.
28. A potter's turntable is useful for showing 3-dimensional objects.
29. The building up step by step of a blackboard diagram is acceptable.
30. In most cases it is preferable to prepare visual material beforehand.
31. It is convenient to make charts, diagrams and captions a standard size. The dimensions should be in a 4 : 3 length to height ratio. The material will then fill a screen.
32. A useful rule for the design of visual material is to use contrast in tone rather than fineness of line.
33. Large areas of white should be avoided. A blue wash will suffice to offset the glare.
34. Glossy card is unsuitable for caption material.
35. If sufficient time, money and skills are available, the principles set down in the chapter on Design should be followed.
36. A Mathematical figure is best shown as an area against a background of contrasting tone, rather than as a line drawing.
37. Caption material should be mounted on vertical stands.
38. All visual material should be tried out under the camera before use.
39. The camera will effectively communicate well tried expository techniques found successful in the classroom.
40. The camera will not enliven the corpse of a dead topic or a dull technique.
41. Mannerisms of gesture, movement and speech are accentuated on the screen.
42. With television in the classroom there are few rules of technique. The camera can communicate the particular style of the teacher.

Extravaganza is occasionally acceptable. Success is the criterion.

43. The teacher should avoid referring to the equipment. In time, the pupils concentrate on the teaching material and take the mechanics of its presentation for granted.
    A reference to the equipment intrudes on the exposition and diminishes the impact of the material.
44. Expressions to be avoided are "As you now see on your screen . . . " and "The camera is now showing you . . . ."
    Always refer to the subject material and not the vehicle of its presentation. Contact with the pupils is then more easily maintained.
    Useful expressions are:—"You will see from this diagram . . . " and "Let us now look closely at . . . ."
45. The teacher must constantly have in mind the true nature of the task, and the order of priorities.
    The child is being taught mathematics by a teacher by means of television.

SECTION C. CLOSED-CIRCUIT TELEVISION LINKING A SMALL NUMBER OF SCHOOLS

1. The obstacles to the useful operation of such a link are the lack of curriculum standardisation and time-table uniformity and the problem of co-ordination between traditionally independent institutions.
2. Unless these difficulties can be overcome, the advantages of small scale working are marginal and cannot justify the expenditure of money, time and effort.
3. Closed-circuit television can be used effectively within one autonomous institution. The alternative is to operate a local educational television station serving a large number of institutions.

SECTION D. CLOSED-CIRCUIT TELEVISION USING A STUDIO

Staffing

1. For a Studio to provide television teaching material for schools it must be adequately staffed.
2. THE WORK TO BE UNDERTAKEN IN A STUDIO:—

(a) Production	Programme administration and policy.
(b) Programme Direction	Supervision of the presentation details of particular programmes, camera scripting, rehearsal and performance.

(c) Design	The preparation of all visual material.
(d) Technical	The maintenance of equipment.
(e) Administration	(i) General control of the Studio.
	(ii) Secretarial.
(f) Programme Presentation	(i) Teaching.
	(ii) Camera operation.
	(iii) Caption changing.

3. THE STAFFING REQUIRED TO UNDERTAKE THIS WORK

	Staff	*Function* (vide para. 2)
(i)	Studio Director	2. (a) and 2. (e) (i)
(ii)	Assistant Studio Director	2. (b)
(iii)	Design Director	2. (c)
(iv)	Technician	2. (d)
(v)	Secretary	2. (e) (ii)
(vi)	Studio Assistant	2. (f) (ii)
(vii)	Studio Assistant	2. (f) (iii)

The teaching is best undertaken by members of staff from local schools seconded for selected periods and then returning to the classroom. (The whole operation will be simplified when video tape recording facilities are available. At present—June 1965—technically suitable video tape-recorders are not available at a price acceptable for general use in schools and colleges.)

4. THE ROLE OF A TRAINING STUDIO

(a) After a studio has been built and equipped, some time will elapse before teachers will feel ready to make the fullest use of it.

(b) Nevertheless, it has been found that teachers more readily recognise the value of television teaching when they have themselves participated in the work of the Studio.

(c) It is therefore recommended that for the first year a Studio should be used for training courses for local teachers.

5. RECOMMENDED DETAILS OF TRAINING COURSES

The course for teachers attending an in-service Television Training Centre should include:—

(a) The techniques of Television Teaching.
(b) The design of visual material.
(c) The preparation of a programme script.
(d) The direction of a programme.
(e) The operation of cameras and the selection of camera shots.
(f) Supplementary work on the Studio Floor during transmissions, e.g. caption changing, assistance with camera re-alignment, manipulation of any additional audio-visual devices in use.

During the course of the Warblington Experiment, teachers felt the need for such training. Many expressed the view that their Studio experience had had a stimulating effect upon their classroom teaching.

In a Training Studio the work of the Studio Assistants (para. 2 (vi) and (vii) above) would be undertaken by the teachers on the Course. This would not only provide valuable experience for them but would also reduce the staffing requirements of the Studio in its role as a Training Centre.

Design

6. A detailed report on the design work of the Studio is set down in Part I, Chapter 5.
7. Skilful and imaginative design of visual material contributes greatly to the success of television teaching.
8. Designing visual material for television teaching purposes is a highly specialised operation.
9. The Studio Designer requires more time and facilities than were available during the course of the Experiment.
10. Adequate workshop and storage space suitably situated are essential.
11. A Design Magazine Library is a valuable asset.
12. There is room for considerably more experimentation in the design field.

Technical

13. Studio equipment is fully described in Part I, Chapter 4.
14. Two-way sound is vital in a two-classroom link where the teacher retains control of the situation. It can be useful in a Studio when a small number of classes are viewing.
15. Good overhead lighting facilities, supplemented by portable floods are essential. Dimming facilities are advantageous. Daylight must be excluded.
16. Adequate air conditioning should be installed. Ventilation by means of the use of small extractor fans is inadequate.
17. Thermostatically controlled central heating is desirable. Overhead infra red heaters take up valuable lighting space.
18. Video tape-recording facilities would be valuable.
19. For simple work, a viewfinder camera and a small caption camera are essential. To exploit the medium fully, two viewfinder and two caption cameras provide a desirable degree of flexibility.
20. All cameras should be previewed in the control room.
21. Separate preview monitors for each camera are not essential. One preview monitor across which is wired an oscilloscope will suffice. The preview picture is then selected by a preview switching bank.

22. A caption camera should have a monitor on the Studio Floor.
23. Floor monitors are required to show the transmission picture.
24. A transmission monitor is required in the Control Room.
25. The provision of a sync pulse generator would be an asset. Such equipment is costly.
26. Vision switching is effective. Vision mixing would be valuable (a sync pulse generator would provide for this).
27. Telecine facilities are of special value for presenting 16 mm. sound films.
28. Telecine inserts in a live programme are particularly useful. The preparation of such inserts is costly and calls for special skills.
29. Sound facilities should incorporate tape, grams and two microphones.
30. Sound mixing facilities are essential.
31. The Studio should have a firm, level floor.
32. The Studio Floor should only have equipment and teaching aids. Provision should be made for separate office, workshop and storage accommodation.
33. The Studio Floor should have gas, water and electricity available for demonstration purposes.
34. Portable demonstration benches are invaluable.
35. Floor length grey curtains provide a useful backcloth.
36. A cyclorama would be invaluable.
37. A blackboard has an occasional use. Blackboards should be vertical, rigid, but portable. A wall mounted board is restricting. The blackboard surface must be matt, smooth and really black.
38. The Studio ceiling should be at least 10 ft. high.
39. The Studio must be soundproof.
40. A remote control panel can be used in a simple programme. A teacher can then direct his own programme.
41. In the case of a more complex programme it is better for the teacher to concentrate on the specific teaching task, leaving direction to be undertaken in the Control room.

General

42. Studio accounting procedures must be carefully developed.
43. As the output of the Studio increases, programme budgeting may become necessary.
44. A Training Studio need not cost individual programmes. Funds should be allocated for expenditure under separate headings. The principal items on which expenditure is required are:—
    (a) Design materials such as Tudor board, Letraset, hardboard, paint, polystyrene.
    (b) Technical spares.
    (c) Film.
    (d) A range of small tools.
    (e) Administration costs.

Flexible arrangements for expenditure can be achieved under the general supervision of the Studio Director.

45. A Studio can only provide acceptable teaching material when it is fully staffed and has adequate administrative, technical and design facilities.
46. Specialised techniques of Studio organisation and television teaching are called for and it is necessary for teachers to acquire and develop these techniques.
47. The particular abilities of local teachers can be mobilised to benefit a much larger number of pupils than normal classroom teaching permits.
48. Teaching material can be presented in a Studio that could equally well be used in the classroom, but which, for various reasons, is not. Studio facilities can also provide for the use of television as a medium per se, presenting teaching that pupils could not otherwise receive.
49. A local Studio can be in touch with local needs and interests.

SECTION E. CLOSED-CIRCUIT TELEVISION. THE PREPARATION OF TELEVISION TEACHING MATERIAL IN A STUDIO

1. A practising teacher whose natural style is felt suitable to television is invited to present a particular topic in which he is well versed.
2. Informal discussions are held to establish common ground and to delineate the area of subject material.
3. The human factor is of special importance. The Studio production staff and the television teacher must be on the same "wave-length". The director must know what the teacher wants and the teacher must be ready to have his technique and material modified.
4. The subject material must then be arranged for presentation on the screen. The demands of the medium particularly affect the sequence of presentation. The complete agreement of the teacher must be obtained to the suggestions of the director.
5. The designer is then asked to prepare the visual material.
6. The designer is an expert and will bring his own talents to bear, but he must interpret very closely the ideas of the teacher and director.
7. The designer's own teaching experience is a useful asset. Director, Teacher, Designer should by now all be speaking the same language.
8. The camera script is then prepared and the sequence of caption and other visual material agreed. All visual material is then checked for lighting.

9. The material is then ready for first rehearsal.
10. Throughout the rehearsal the director must make a number of decisions affecting, for example, moves and technique. In asking the teacher to submit to this criticism, the director should never intrude on the teacher's professional integrity. In the last instance, this is a matter of personal relationships.
11. Any prospective television teacher must be willing to co-operate fully with the director. The production of a programme is a team effort. The leader is the director, the principal performer is the teacher. There is no room for the striking of attitudes. The television teacher must accept a situation in which he cannot be the final arbiter in the selection of subject material or choice of techniques.
12. It has not been found necessary to have the teaching material scripted and learnt by heart. Teachers are specialised communicators. The director should leave the teacher to develop his own style within the limits of the medium. These limits are the range of artistic and technical devices selected for the programme.
13. The teacher must memorise:—
    (a) cues; (b) moves; (c) the sequence of material.
    For the rest he should be encouraged to rely on his own expository style.
14. This is the significance of teaching by television. It is akin to dramatic production. The director establishes production procedures. The teacher is left with room to develop his own particular technique. Television teaching does not lose the vigour of spontaneity. It does gain the power of well marshalled presentation.

SECTION F. CLOSED-CIRCUIT TELEVISION USED FOR TEACHER TRAINING

Class Observation

1. Television cameras can be used for the observation of a classroom lesson.
2. Two cameras can be used effectively; one directed on the class, the other on the blackboard. It is accepted that only a general view of the classroom is obtained.
3. Each camera can be directly linked with its own monitor in the viewing room, providing two pictures simultaneously and obviating the need for vision switching.
4. Sound is fed from a paraboloid microphone centrally fixed above the classroom blackboard to a loudspeaker in the viewing room.

5. Given a good standard of diction, this microphone is most adequate. Casual asides can be heard.
6. The cameras need not be adjusted during transmission and are switched on and off remotely.
7. There is no interruption of the class under observation.
8. Up to 35 students can watch a transmission.
9. The system is simple, reliable and relatively cheap.
10. The system does not provide for close-up shots of individual pupils (vide paras. 17-18 below).
11. The success of this simple system depends on:—
    (i) Picture quality.
    (ii) Lighting conditions.
    (iii) Pupils' diction.
    (iv) The use that is made of the observation pictures.
12. The system does not provide a television programme but rather, another type of visual aid to supplement and illustrate the College Lecturer's own advice on classroom teaching methods and techniques.
13. This system has a modest aim. Only a general view is obtained, but it does illustrate what really happens in a school classroom and such visual and aural information is valuable to student teachers.
14. Class observation by this method is no substitute for other aspects of teacher training. The student will still need experience with children.
15. Observation by television can provide students with a view of classroom procedures that they could not obtain by their presence in the classroom itself. If they are physically in the room and remain unobtrusive, they cannot see all that is happening, and if they are not unobtrusive, their presence changes the situation and they see what does not normally occur.
16. It is emphasised that class observation using simple equipment can do no more than give students a general idea of what actually occurs during a classroom lesson. The good and indifferent practice present in most lessons can be observed. Students can scrutinise methods of subject teaching and classroom control. This is only a small aspect of teacher training but the exercise is valid and important.

Child Study

17. Child study requires more complex and expensive equipment.
18. The close-up of an individual child can be obtained:—
    (a) by equipping a simple camera chain with remote control pan and tilt head and zoom lens. These are costly and require someone to operate them.

(b) by moving a viewfinder camera, operated by a camera man, amongst the children in the classroom—again costly and complex.

(*N.B.*—The evidence obtained from the very limited experience of this particular type of work during the Experiment makes the drawing of any firm conclusion unwarranted.

On one occasion only a class of 16 pupils was taught inside the Studio. One viewfinder and one remote control camera were fed to separate monitors and three teachers viewed both pictures simultaneously. The viewfinder camera was moved amongst the pupils, who ignored the equipment. Possibly this was because they had previously been invited to tour the Studio. Close-up pictures of pupils' work and reactions were of a fair quality. Technically, the operation was successful but everything was specially prepared. It was not possible to attempt this under the normal routine of the class concerned.)

Training for Television Teaching

19. Studio facilities can be used effectively for introducing student teachers to the techniques of television teaching.
20. It is suggested that the organisation of such training would be simpler when the Studio is situated in and administered by the College of Education.
21. The number of students attending the Studio at any one time should be kept small.
22. Teaching aids used by the student teachers should be designed and made under the supervision of the Studio Design Director. The cost of the materials tends to be high. It is probably more convenient for these costs to be met out of Studio funds.
23. When preparing a television programme a student is obliged to reduce his material into its elements and arrange it for detailed, step-by-step presentation. This process is extended under the disciplines of Studio rehearsal. The student's technique is corrected at every stage. Something akin to drama production is undertaken.

    Most teachers and students find their first appearance before the camera an ordeal. Camera experience builds up confidence.
24. It is suggested that when a Training Studio forms an integral part of a College of Education the staff required would be:—

    DIRECTOR, DESIGN DIRECTOR, TECHNICIAN, TYPIST.

    This small staff could work as a unit within the College Education Department.
25. If television is to play an increasing role in education, then clearly it is something that every college student should study.

The amount of college time and resources devoted to television study is a decision that must be made by the Colleges themselves.

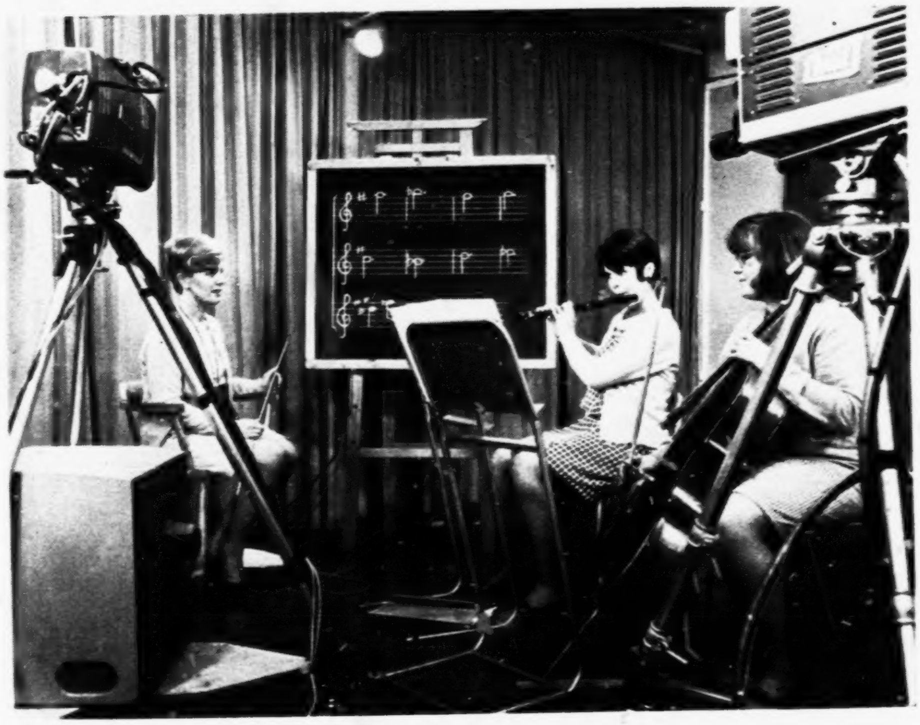
SECTION G. CLOSED-CIRCUIT TELEVISION LINKING A LARGE NUMBER OF SCHOOLS

The following observations are not based on direct experience, but it is considered that the knowledge derived from the researches of the last three years justifies their inclusion.

1. Studio and relay facilities are required to link a large number of schools.
2. The requirements of a Studio are set down in Section (D).
3. Relaying of audio and video signals can be effectively achieved by use of a land-line.
4. As the total size of the system increases, the cost of installing additional receiving points in particular schools becomes very much cheaper. The Law of Increasing Returns comes into operation. It should be possible then to equip each school with a number of monitors. This is most desirable.
5. The carrier-wave system is an improvement on the use of a multicoaxial cable.
6. Six channels, each of which is selected by the turn of a switch at the reception point, would be acceptable during the early stages.
7. The local Studio would provide at least one signal; the remaining signals could be off-air broadcasts of radio or television.
8. The Studio technician should be responsible only for the signals leaving the Studio.
9. Separate provision would need to be made for the maintenance of the distribution system and reception facilities.
10. The relaying of signals would originate from a Distribution Centre housed in a small building and well situated for off-air reception. Such a site would not necessarily be adjacent to that of the Studio.
11. This system would provide all local schools with a choice of off-air broadcasts and locally prepared teaching material.
12. Without time-table uniformity and curriculum standardisation, the locally prepared material would simply be offered to local schools to select or reject. The only advantage over off-air schools broadcasts would be the local flavour of the programmes and the participation of local teachers in the preparation of material.
13. This application of closed-circuit television in schools is akin to local broadcasting and only seems justifiable on a large scale and in a closely-knit urban community.

THE STUDIO
IN ACTION

Demonstrating the role of the Conductor with an orchestral group.



Pupils help to illustrate a point in a Study of Haydn.

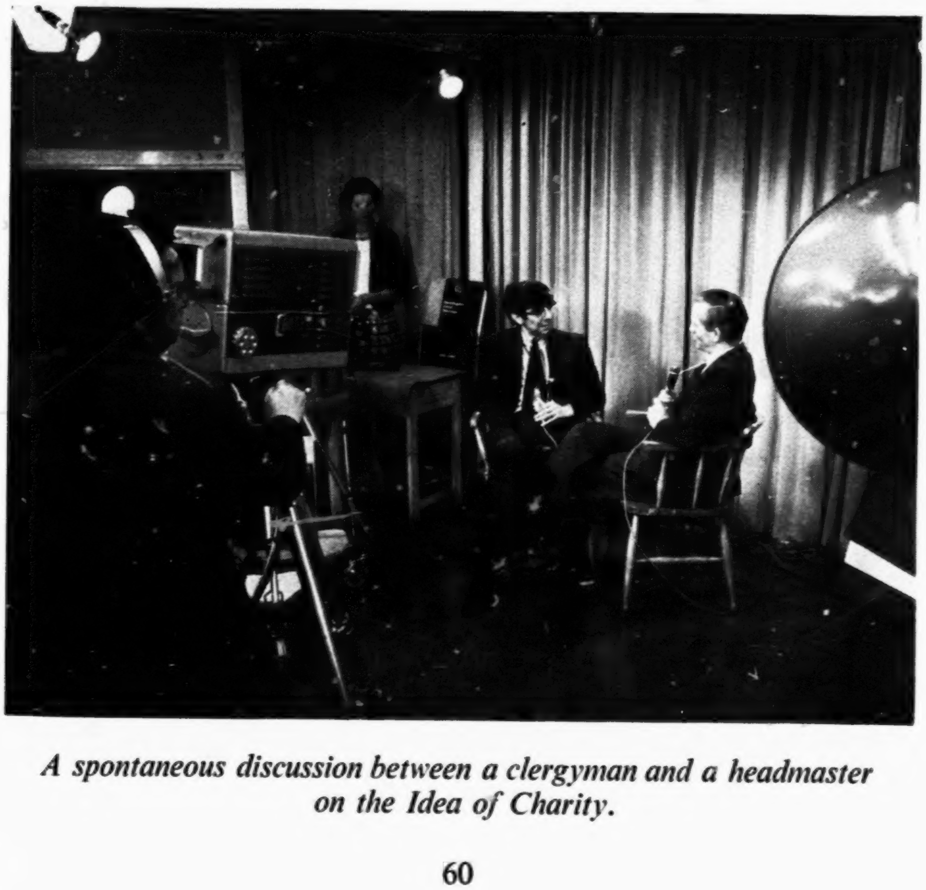
A class viewing a programme on Architecture. The teacher operates the two-way sound. The observation camera is for teacher training.

Directing a History of Art programme using three cameras. The operation is complex. Timing is essential.

The Director discusses a point of technique in a Road Safety rehearsal. Careful preparation is always necessary.

An introduction to Narrative Writing with the aid of visual material.

The interview for the first job. An exercise for school leavers.



A spontaneous discussion between a clergyman and a headmaster on the Idea of Charity.

PART II. CHAPTER 1.

OBJECTIVE ASSESSMENT—AIMS

During Phase II of the Warblington Experiment, it became increasingly apparent that an objective assessment of the television medium was needed to ascertain its most effective use. Many qualitative judgements had been submitted, and tentative conclusions drawn, but no statistical evidence was available to support or refute the subjective evaluations. It was decided, therefore, to implement a series of controlled experiments to investigate questions which had arisen during earlier phases of the Experiment.

In general, the major aims of the Objective Assessment were not specifically directed at comparing the use of closed-circuit television with conventional classroom methods, although the design adopted in several experiments provided evidence relevant to this question. The view was taken that, given closed-circuit television as an accepted medium, the research should be directed towards investigating its most effective use.

The present Headmaster of the Warblington County Secondary School suggested some profitable areas of research. A list of questions considered amenable to objective evaluation was subsequently compiled. Experimental hypotheses formulated during Phase III were largely based on the following queries.

Information Gain.

1. To what extent does it matter if the teacher giving a television lesson is known by the viewers, and conversely ?
2. What are the effects of transmitting programmes over a link between various schools ?
3. To what extent is the retention of knowledge and its post lesson application enhanced by learning through a television programme rather than by normal lessons ?
4. Should television play solely a supplementary role in school teaching or can it at any time replace the classroom teacher ?
5. Can an entire academic course be presented on television or should only a proportion of the curriculum time be allocated to television ?
6. Is television more effective when combined with preparation and follow-up work in the classroom ?
7. Can a specialist teacher be employed to greater advantage using closed-circuit television ?
8. Is there an advantage in presenting television material to children of limited abilities compared with children from a more gifted stream ?

Programme Content, Presentation and Reception.

9. To what extent does an enrichment lesson stimulate the use of other source material in the school, e.g. libraries, questions to teachers ?
10. Should viewers take notes in lessons and, presuming this to be useful, to what extent can television stimulate this activity?
11. Assuming the programme is in quasi-lecture, or direct teaching form, should there be time for exercises or even a break for "re-alignment" ?
12. What is the optimum length of viewing time ?
13. To what extent can a lesson be more effectively learned by the use of two-way sound ?
14. What are the advantages of preparation, scripting and rehearsal, or can a programme be presented without this degree of planning ?
15. Does introductory, background and fade-out music add or detract from the value of the programme ?
16. What is the role of the supervising teacher in the classroom ?

Influence of External Factors.

17. To what extent are pupils' attitudes to programmes affected by:—
    (a) The use of television in the home?
    (b) The number of open-circuit programmes viewed weekly?
    (c) The age of pupils ?
18. How does the attitude of the classroom teacher to the use of television determine the value of the television lesson ?

General.

19. Has closed-circuit school television any advantages as opposed to open-circuit ?

The preceding questions were among those investigated using experimental methods. During the course of Phase III, several other aspects of the use of closed-circuit television arose for consideration. Some were peripheral, others central to its use in schools. Wherever these could be quantitatively assessed and were sufficiently relevant to the major aims of the experiment, they have been included in the reports of individual experiments or in Chapter 5 "Discussion and Conclusions".

PART II. CHAPTER 2.

REVIEW OF RELATED RESEARCH

During the past ten years several inventories of research on educational television have been published to furnish conclusions about the effectiveness of television in education, and some of the qualities concomitant with its successful use. Foremost among these comprehensive reports is the work of Kumata (1956:1960), Holmes (1960), Schramm (1962) and Brown (1964).

One of the irrefutable findings is that pupils can learn as efficiently from instructional television as through conventional classroom methods. The conditions under which optimum learning occurs with both media have yet to be determined. Schramm (1962) collated results of 393 investigations in which television instruction was compared with classroom teaching, selecting for inclusion in his discussion only those experiments with adequate design, control and statistical treatment.

A selection of his findings for grades 7–12, covering 141 investigations within the age range 12–17 years, is summarised here. It is clear that television instruction has been, in the majority of cases, as effective as conventional methods when objective evaluation has been made. Also television teaching has been relatively more successful in grades 7–9. It has been suggested that different teaching methods, and the use of television to augment regular classroom instruction could be partly responsible for its greater success within the lower grades.

The combination of grade level and subject area together appears to be partly responsible for some of the success. For example, the Humanities and Health and Safety seem to be more effectively taught on television to younger pupils. Science and Social Studies programmes are equally successful for both age groups. The evidence on the teaching of Language Skills, available only for grades 10–12, points to doubtful success.

Studies of information gain among high and low ability groups provide contradictory evidence. In some experiments the brighter pupils learned more from television; in some they learned less. It is possible that the difficulty level of subject matter and the mode of presentation are determining factors. The conclusion generally drawn is that "homogeneous ability-level groupings should be used and that television lessons should be pitched to that level to avoid losing either high or low ability students when heterogeneous groupings are used". (Kumata, 1960, p.180).

On television, the straight talk to the camera produces greater information gain than does a discussion, in which pupils do not actively participate, but merely observe. The main reason is probably that it is more difficult to extract relevant information from a discussion compared with organised presentations.

Moreover, information gain can be adversely affected by inappropriate illustrations. There is evidence that too much or irrelevant visual material distracts the attention of the student to such an extent that learning is interfered with; but since television is essentially a visual medium, pictures which themselves communicate the desired information will enhance learning.

Partly as a consequence of the organised presentation of visual aids, an equivalent or greater gain can be effected in a shorter period of time when television is the communicating medium compared with conventional methods.

Where re-tests have been administered after a time interval, no significant differences are reported of differential retention as a function of medium of instruction. One study only recorded a significantly greater proportionate loss among students taught by face-to-face methods than among television taught students.

The availability of talk-back facilities does not affect information gain. However, almost all investigations report that pupil attitudes towards television instruction are more favourable when such facilities are available, even though they are rarely used.

Evidence on attitudes of students of all age groups to television teaching suggests a varied reaction. Primary school children are typically enthusiastic but secondary school pupils and university students tend to reject television. Primary school viewers think they learn more from television lessons, whereas secondary school pupils are doubtful or think they learn less.

There is some evidence that pupils with previous experience of television instruction are more favourable in attitude than those receiving it for the first time. Apparently pupils have preconceived ideas of what constitutes an acceptable method of communication, and these must be modified through experience before the new medium is accepted.

In most cases there are no significant differences in attitudes towards particular courses of instruction between television and conventionally taught classes. No boomerang effect is reported—all changes are in the desired direction and are independent of students' attitudes towards television as a medium of instruction. However, some investigations report that face-to-face methods are more effective than television in overcoming socially determined prejudices.

There appear to be few studies which have attempted to investigate the effect on pupils' attitudes towards subject areas, when television lessons introduce new dimensions in content and presentation of subject material. Unless experimental reports describe programmes in some detail, it is virtually impossible to determine whether lessons were of the conventional type, adapted to varying degrees to the television medium, or whether the approach to subject material was novel and its implementation exclusive to the new medium of instruction.

PART II. CHAPTER 3.

MEASURING INSTRUMENTS

The dearth of suitable evaluation instruments constituted one of the major difficulties to be overcome in conducting an objective assessment. The use of tests of information, attitude scales and programme evaluation sheets which have been constructed and used in overseas studies, invariably raises questions of comparability of standardisation, programme content, terminology and concepts. Few locally constructed instruments had national application and none had the regional bias necessary for investigation of more specific areas in the research. With the exception of the National Foundation for Educational Research Secondary Verbal Tests I and II of general scholastic aptitude, and the Schonell Mechanical Arithmetic—Form A and Diagnostic English Tests I and III, all tests were developed expressly for the investigation. They included tests of information, scales for measuring attitudes to subject areas, concepts and televised instruction, questionnaires and teacher/observer programme evaluation forms.

Measurement of Information. With both written and verbal tests a primary consideration is that they reflect the areas of information covered during the communication process. Otherwise conclusions based upon obtained scores may be misleading. It was therefore imperative that the evaluative material be prepared after programme content had been decided upon. However, this precaution itself had limitations. Technical faults in transmission were not infrequent. It was anticipated that, at times, full coverage of material in either control or television groups might not be possible. The decision was therefore made to construct tests of information after lessons had been presented. In this way only material common to both control and experimental groups would be tested.

Experienced teachers were at all times responsible for suggesting test items and, after consultation with the experimentalist, a panel of judges selected suitable questions. There is little doubt that the content validity of tests was established; it can be safely assumed that they were truly measuring the variables under consideration.

It should be considered a necessity in research of this kind that evaluating instruments be adequately pre-tested. Unfortunately, in the present research programme, this was not always practicable. Time was limited and appropriate groups unconnected with the experiments were seldom available. Regrettably, therefore, estimates of the reliability of tests of information were not calculated.

Both verbal and written tests were administered. The particular procedures adopted were dependent upon experimental requirements and are discussed within specific subject areas in Chapter 4.

Wherever possible tests were administered by a trained experimentalist. Occasionally, in order to eliminate the exchange of information among pupils, it was necessary to test several classes during a single school period. Whenever this necessity arose, detailed standardised written instructions were issued to teachers in charge. At all times verbal tests were administered by the one person.

Measurement of Attitudes. Several determinants were responsible for the decision to incorporate the measurement of attitudes within the compass of the experimental evaluation. Firstly, it was considered desirable to investigate the feelings, or the extent of liking or dislike, of pupils towards television as a medium of instruction. Within this general area, changes in attitude due to increased familiarity with the medium were examined. Inter-age differences were also recorded.

Secondly, a correlation was hypothesised between pupils' attitudes towards particular subjects generally, and their attitudes towards the content and presentation of material within these subject boundaries. That is, it was expected that pupils' attitudes towards their school subjects would be determined by what and how they were taught. To test this hypothesis, pupils in experimental groups were given "enrichment type" television lessons in addition to their normal school curricula. These lessons were such that it would be difficult or impossible to present them under conventional teaching conditions. It was assumed that if television material was conducive to the formation of more positive attitudes towards selected school subjects, then the increased level of emotional involvement would lead to better performance on objective test of information gain.

Finally, in some areas of instruction, notably Religious Education and Road Safety, the teaching task is primarily directed towards modification of existing attitudes or the formation of more acceptable ones. Attitude scales were administered to determine whether, in fact, televised instruction could bring about desired changes.

A. DIRECT QUESTIONING.

The method of direct questioning to deduce attitude direction was reduced to a minimum in the present investigation. Most children are extremely sensitive to adult reactions and notoriously eager to give responses which they consider acceptable. This situation is particularly evident in face-to-face interviews. Edwards (1957) outlines other technical reasons for the lack of validity and reliability of the interview technique. On the whole, whenever pupils gave opinions to teachers or experimental staff, they did so spontaneously in conversation during their usual lessons.

After presentation of the series of programmes entitled "How Free Am I ?", children were asked to submit written replies to carefully selected questions. Their responses were analysed by a method similar to that employed by Himmelweit (1958, p.289).

B. OBSERVATION OF BEHAVIOUR.

Direct observation of the behaviour of children with respect to a particular variable is another approach to the problem of attitude assessment. Teacher/Observer Programme Evaluation Forms provided records of pupils' reactions to individual transmissions. Results from these assessments could not be collectively analysed, except through frequency counts, as there is considerable doubt that data from such reports are additive. Also, observed behaviour may itself fail to reveal the feelings of the individuals under observation. The anomaly is particularly relevant in the case of school children, who quickly learn to appear interested in order to avoid the consequences of inattention. However, as all the teachers who submitted reports were trained and experienced in classroom procedures and, in addition, knew the children under observation personally, some reliance was placed on their assessments of the effects of individual programmes.

C. ATTITUDE SCALES.

In view of the inherent weaknesses in methods already discussed, it was necessary to construct technically acceptable scales for intensive investigation of some aspects of the experimental programme. These instruments were used in three ways. The scales attempted to measure:-

(i) Attitude to television as a medium of instruction.
(ii) Attitude to particular subjects taught through television.
(iii) Attitude towards concepts presented in televised lessons.

A. Likert Scales

Likert type "Attitude to Television", "Attitude to Music" and "Attitude to Charity" scales were constructed according to Edwards' (1957) method of summated ratings. Favourable and unfavourable statements towards the psychological object were submitted by members of the teaching staff and supplemented by suggestions from other sources. One important consideration was that vocabulary and grammatical construction of sentences should be comprehensible to a wide range of pupil age and ability. Suitable statements tended to be simple and concise.

During the preliminary try-out of statements and final administration of the scales, children were instructed to use one of five categories of response:— strongly agree, agree, not sure, disagree, strongly disagree. Weightings for statements ranged from 0 to 4.

All original statements were subjected to item analysis using total try-out groups of at least 33 pupils. Wherever possible, these were comparable in age and attainment levels with the experimental groups to whom completed scales were later administered. Item analyses were carried out using the "t" test, as suggested by Edwards, to discriminate between the performance of the upper and lower 30% of each try-out group. A pre-determined probability level of ·05 formed the acceptance/rejection criterion of statements.

B. Thurstone-Chave Scales

The author is indebted to D. Jordon (1937) for the use of his Thurstone-Chave type scales for measuring attitudes towards Mathematics and History. Slight adaptations to some statements, and the deletion of others considered irrelevant, were necessary to comply with the demands of the present investigation.

An "Attitude to Art" scale was constructed by the method of equal appearing intervals. Wherever possible, statements parallelled those included in Jordon's scales. In this way it was hoped to investigate the stability of the older instruments and to establish a foundation for comparison of attitudes between subject areas, if such an avenue of enquiry appeared fruitful.

A list of 48 statements about Art were presented to two classes of Sixth Form Grammar School students. One group contained 12 boys and girls following a science course, while the other comprised 14 Arts students. Instruction followed the usual pattern with judges being asked collectively to assess the degree of favourableness of feeling expressed by each statement. Eleven categories represented by the symbols A to K were provided. Scale and Q values were calculated separately from the rankings of each group. These independent estimates were almost identical and support the evidence presented by Rosander (1936) when independent groups of 15 judges produced correlations as high as ·99. It would appear that the quality rather than the quantity of judgements is a decisive factor in the selection of reliable and relevant statements.

Use of Questionnaires. The use of written questionnaires to sample opinions or factual information is widespread in research studies into the use of television (Himmelweit, 1958; Schramm, 1961; Daines, 1965). However, unless the completion of relatively simple forms is clearly explained or closely supervised, the reliability of obtained results is often debatable. One method of trying to overcome the difficulty is to have preliminary try-outs employing populations similar to those with which the forms will later be used. In this way it is possible to isolate, and if necessary eliminate, ambiguities, irrelevancies or deficiencies in the original constructions. In the present experiment, both the Teacher/Observer Programme Evaluation Forms and the Parent/Pupil Questionnaires on home viewing habits were given trial runs before the final format was established.

There were several reasons for the distribution of Programme Evaluation Forms to teachers:—

(i) Forms provided a record of sound and picture reception in each viewing room.

(ii) Teachers were asked to estimate the number of children showing interest in each programme, and the degree of interest displayed.

(iii) When relevant, willingness of pupils to participate actively in lessons was also recorded.

(iv) Class supervisors were made responsible, as far as possible, for viewing conditions including seating accommodation, darkening of room and prevention of unnecessary interruptions.

(v) Opportunity was given for teachers to submit follow-up suggestions.

(vi) It was assumed that the request to complete and submit forms would involve teachers more closely in the Experiment itself.

Parent/Pupil Questionnaires on home viewing habits provided a complete list of programmes available on television in the Havant area between Saturday, 20th March, and Friday, 26th March, 1965, inclusive. Parents and pupils indicated individually which ones were viewed during the week. Where programmes formed a series, respondents marked whether they had seen all, most, about half or a few. An approximation was also obtained from each person of the weekly number of viewing hours. Questionnaires provided information for establishing comparability of home viewing habits between control and experimental groups. In addition, differences in number and type of programmes viewed by first and third year pupils (11+ years and 13+ years) were investigated. An attempt was also made to correlate open-circuit viewing habits with attitudes to television lessons.

For both preliminary and final administration of questionnaires, detailed verbal and written instructions, supplemented by demonstrations, were given. Teachers and pupils were invited to ask questions at any time prior to dates set for submission of the forms.

Although respondents were in no way compelled to supply the requested information, all proved extremely willing to co-operate. Functionally, they constituted a captive population, so that the percentage of non-returns was almost negligible. In the various experiments questionnaires were administered to total groups. As no attempt was made to *sample* at a particular age or ability level, the use of sampling methods or statistics (Yates, 1953) was not applicable in this area of the overall investigation. Conclusions, which are presented in relevant sections of the report, are based on frequency counts only.

PART II. CHAPTER 4.

SELECTED EXPERIMENTS

In this chapter several experiments are reported in detail. The decision to include some and omit others was arbitrary and based on the assumption that the report should incorporate a representative sample of experimental designs employed, statistical analyses and the types of problems encountered when implementing a research of this kind. No attempt was made to select the "best" experiments; that is, those in which everything proceeded according to a preconceived plan. As experienced workers in the field of educational research realise, there are comparatively few of these, even under the most auspicious circumstances. Nor are only the most "successful" experiments reported; namely, those where television classes achieved consistently superior results to conventionally taught groups. The experiments are intended to provide a reasonably comprehensive and unbiased selection so that an assessment might be made of the contribution that closed-circuit television has to offer to secondary education today.

SECTION I. MATHEMATICS.

In view of the current interest in the teaching of mathematics and the observed success of the "New Mathematics" programmes in Phase I, an investigation was made into the effects of television teaching in this subject. The three areas studied were Binary Arithmetic, elementary Algebra and an introduction to Trigonometry. The present experiment reports the result of three lessons, separated by weekly intervals, on Binary Arithmetic. Reference will be made to the other Mathematics experiments whenever results conflict with or corroborate evidence obtained during this investigation.

There were five aims of the Binary Arithmetic series:—

(i) To test the hypothesis that successful use of the television medium, particularly at lower ability levels, necessitates different methods of presentation from traditional classroom procedures.

(ii) To compare the performance of pupils taught through television with that of comparable groups receiving conventional instruction.

(iii) To investigate the effect of delivering programmes to a range of academic ability.

(iv) To determine the result when children in a linked school receive television lessons from an unknown teacher.

(v) To provide an estimate of the performance of all groups in a re-test situation after a time interval of six weeks.

Subjects. Five classes of first year County Secondary School pupils were used.

Three groups consisted of higher ability level children (average I.Q. 111·5). One television and one control group each of 37 pupils were selected from School A, with groups matched for age, academic ability, mechanical arithmetic proficiency and home environmental factors. The third higher ability class of 26 pupils from School B was pre-tested on the same measuring instruments used in School A. Analyses of Variance established that no significant differences existed among the three groups in age, general academic ability and arithmetic achievement. No attempt was made to equate environmental factors, for example, home viewing habits, number of children in family, and estimated parent interest, between the two schools.

Two lower ability classes (average I.Q. 100·7) were formed from School A by random allocation of an original population of 53 pupils. The television viewing group contained 25 children while the conventionally taught group numbered 28. No significant differences were found on a pre-test schedule identical to that administered to the higher ability classes.

The means of the combined high ability groups in School A were significantly superior for academic ability and arithmetical achievement, to the means of the combined lower ability groups.

Conventional Lessons. An experienced specialist mathematics teacher from School A was responsible for the 35 minute control group lessons. Method of presentation of subject matter assumed a direct blackboard form, with pupils taking notes and completing exercises in class. Homework examples were also given. The teacher reported some difficulty in covering the prescribed area of information during the lessons.

Television Lessons. The three experimental groups received identical information, presented by the same teacher, as the control groups. Television lessons were also the direct blackboard type and varied in length between 15 to 20 minutes. Children were instructed by the television teacher to take notes and time was allowed at intervals during the programme for the completion of this task. Some mathematical examples were also given and corrected by the television teacher. Homework requirements were identical for control and experimental groups.

Teachers and observers reported on their Programme Evaluation Forms that sound and picture reception was good or fair in the higher ability viewing room in School A. It was more often fair to unsatisfactory than otherwise in School B and in the lower ability classroom. Only one good report, for picture reception, was received from the supervisor of the lower ability stream. No adjustments to sound and picture levels were possible once transmission had commenced. At this stage of Phase III no technician was employed in the studio and the person responsible for technical arrangements was, in this experiment, also the television teacher.

In those classes where reception was poor, interest level of pupils was varied. On the whole, most appeared fairly interested. One supervisor reported that initial interest was high, but decreased as the programme progressed. He suggested that apart from transmission difficulties, children were disappointed when they raised their hands to answer questions, but could not communicate with the television teacher.

One of the aims of the experiment was to examine the effect of placing a camera in front of a classroom teacher, with little preparation in presentation of material to conform with the requirements of a different medium. Although many questions were rhetorical, it was apparent that the conventional classroom technique of question and answer was not successful on television. In later programmes, where questions were reduced to a minimum, children were instructed to record written responses. During the Trigonometry series, which also consisted of unprepared direct blackboard teaching programmes with no adjustments for the television medium, children made the same complaint about the lack of opportunities for pupil participation. In the latter series the limited use of two-way sound was not successful. Pupils appeared to be more disturbed at the inability to ask questions spontaneously in the Mathematics series than in any others, where the problem did not arise.

In the first Binary Arithmetic programme it was assumed that all pupils had some knowledge of indices. According to the supervising teacher's report, the lower ability television group did not have this background. Presumably, as allocation to groups was strictly random, the control group did not possess it either. At this ability level, a more detailed introductory course, or pre-transmission preparation, was necessary.

Among the higher ability group in School A, where sound and picture reception was satisfactory, most children were interested, with a few showing great interest.

Except in the lower ability class, where initial participation was only fair during the first programme, all groups spontaneously followed instructions from the television teacher.

Results. At the end of the experimental session a classroom test of information gain was given to all groups. The same test was re-administered six weeks later.

1st Test

Initially the use of a two way classification Analysis of Variance was contemplated based on data from School A only. However, as equal numbers within cells are desirable for ease of computation[1], and the results of testing in School B were considered worthy of inclusion, two Analyses of Covariance, one at each ability level, were carried out. This particular statistical technique, using the National Foundation for Educational Research Secondary Verbal Test I as the adjusting variable, made allowance in the analysis for initial academic ability of pupils. In this way, only differences in achievement on the Binary test due to methods of instruction were investigated. Adjusted mean scores for the better pupils in School A control and television classes and the experimental group in School B were 26·67, 26·32 and 22·51 respectively. Subsequent application of Duncan's Multiple Range Test revealed no real difference in achievement between the television and non-television groups in School A. The television class in School B performed significantly worse than either of the other two groups ($F = 5{\cdot}0944$; with 2 and 96 d.f., $p < {\cdot}01$).

Results of the analysis of data from the lower ability stream in School A indicated that pupils taught by conventional methods achieved significantly superior scores to those receiving television lessons ($F = 7{\cdot}0492$; with 1 and 50 d.f., $p \doteqdot {\cdot}01$.) After adjustment, means were 16·88 for the conventionally taught group and 11·65 for the television class.

2ND TEST

Analyses of Covariance were again carried out at the two ability levels using initial test scores as the adjusting variable. Among the means of the higher ability groups no statistically significant differences were registered after adjustment was made for performance on the first test. The corrected averages, however, were slightly superior for both television groups compared with the control group: School A control and television classes obtained 20·99 and 23·00 respectively, while the School B television group obtained an average of 22·78.

In the lower ability stream, a significant difference in achievement was obtained between adjusted re-test means. The television group retained more of the original instruction than could be expected from the operation of chance factors only ($F = 4{\cdot}3918$; with 1 and 50 d.f., $p < {\cdot}05$).

Discussion.

1ST TEST

The result of comparability of achievement between control and television groups in School A on the initial test is consistent with reports from other investigations. School B results, on the other hand, raise several questions. It is possible that the use of an unknown teacher, home environmental factors, remoteness of the supervising teacher from staffroom discussion, poor viewing conditions, or a combination of all the preceding variables was responsible for depressed performance. However, it is likely that technical faults were among the chief determinants. Children could not receive comparable instruction to the other higher ability groups. This deficiency could not be entirely remedied during the limited follow-up period as the supervising teacher himself relied on the programme for lesson content. The need for adequate teaching notes to augment television instruction has been emphasised elsewhere in this report.

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[1] *It is possible to test the appropriateness of conducting a multiple analysis when there are unequal numbers within cells by using the method suggested by G. W. Snedecor and G. M. Cox "Disproportionate Subclass Numbers in Tables of Multiple Classification". Iowa Agricultural Experiment Station Research Bulletin. No. 180, 1935. However, the conclusion of the third higher level ability group did not permit implementation of the test.*

Although the supervising teacher in School B reported that children lost interest when talk-back facilities were not available, no evidence was obtained from the Trigonometry series, where these were employed, that their use improved performance. Children in viewing classes obviously enjoyed hearing direct questions aimed at a particular group, but supervisors found it difficult to handle the situation in the classroom. Pupils tended to respond "en masse" until one was selected to reply. A good deal of repetitive encouragement was needed before pupils would speak loudly enough for their answers to be audible over the communication system. Details of the successful use of two-way sound under the different conditions of Phase I are presented in Part I, Chapter 1, and further difficulties of operating the facilities under the present arrangements are also discussed in Part I, Chapter 3.

The discrepancy between the performance of the lower level control and experimental groups on the initial test, may again have been due to poor reception. However, the obtained difference between the means was so great that there is some support for the assumption that another variable was also operative.

Kumata (1960) recommends that it is inadvisable to direct programmes at different ability levels, as presentation of material should vary according to the intellectual capacities of pupils. Our own experience with Binary Arithmetic and with the Trigonometry programmes also, which were received by a two year age range, and Grammar to County Secondary School ability groups, supports the recommendation. Under such conditions few pupils receive the best instruction.

It has been suggested that highly illustrated programmes are more suitable for the less intelligent child. However, it would appear that the problem is more fundamental than this. Other factors of presentation, partly dependent upon the use of visual aids, deserve consideration. Among these are the density and pace of the programmes. Density is defined as the amount of material presented, and pace as the speed of presentation. It is highly probable that rapidly moving programmes such as the Binary Arithmetic and the Trigonometry series, where there is little redundant information, are not the most suitable for pupils of any level of academic ability. This hypothesis is supported by the results of the Algebra programmes, which were rehearsed, employed simple visual material, and hence were slower and more repetitive. In the latter series, results of objective testing indicated that both control and experimental groups of lower ability performed equally well. In addition, the television group at the higher ability level obtained slightly better results than the control group.

When conventional methods are used on television, the temptation may be to present material too quickly, particularly in the teaching of mathematics. Factors which inhibit the speed of lessons in the classroom, particularly to the advantage of the slower pupils, are absent from the television studio. It is unlikely that mere repetition is the solution to the problem of pace, as slower pupils become quickly bored. An alternative may be to develop the topic in a wider variety of ways than could normally be achieved in the classroom.

Educationists are aware of the unsuitability of direct blackboard teaching, particularly with lower ability pupils. The probability of improved performance of both control and experimental groups, if use were made of illustrated material, is fully realised, and substantiated by results from the Algebra series. However, the point to be considered is that, on television, a greater quantity and better quality of visual aids is possible than under the pressures of normal classroom teaching. Even when pupils are very gifted academically, more time than was allocated during the Binary Arithmetic or Trigonometry programmes, is needed for them to form new concepts and to consolidate methodology.

2ND TEST

In the re-test situation both television groups retained a greater proportion of their original learning than the control groups, although the obtained differences were statistically significant for the lower ability stream only.

Most research has reported no differential on delayed recall as a function of mode of presentation of material. What factor then, was responsible for the superior performance of the television class of lower ability in the present experiment ? The medium itself may have provided a frame of reference for pupils, thus facilitating recall. The Binary Arithmetic series was presented early during Phase III so that the novelty of seeing lessons on television for the first time could have aided pupils. This variable, however, was common to the higher ability groups also, where no real difference was registered. On the other hand, the proportionately greater retention may have resulted from an inherent factor in the medium, effective only with lower ability pupils. As no duplication of this section of the experiment was made, there is no evidence to falsify or corroborate the obtained result.

Conclusions. What conclusions may be drawn from the three series of Mathematics programmes ?

(i) Firstly, it is advisable to present television lessons to a very limited range of pupil age and ability. Not only is the prior information that pupils bring to a lesson of varying magnitudes, but also their ability to assimilate the presented material depends on many factors. Obviously the difficulty level of material is one important consideration. In addition, methods of presentation must vary according to particular needs if the best results are to be achieved. While children of all ability levels performed better on objective tests when presentation was adapted to the television medium, poorer pupils, particularly, were adversely affected when it was not. Unmodified classroom lessons moved too quickly for these children, who became disturbed when they could not communicate to the television teacher their inability to follow the lesson.

(ii) Unless written responses were demanded, the normal classroom technique of question and answer was not suitable on television. On the whole, it appears preferable to limit such questions considerably in comparison with conventional teaching use.

(iii) In the Binary Arithmetic series, achievement of pupils in a linked class was lower than that of comparable groups in the parent school. It is probable that technical difficulties were at least partly responsible for the depressed performance.

(iv) Children were not hesitant in taking an active part in television lessons. When instructed by the television teacher to work and correct examples, the classes, as groups, participated completely and spontaneously.

(v) On a re-administration of the Binary Arithmetic test, both higher and lower ability television groups achieved higher scores than control groups after adjustment had been made for initial performance. The difference in delayed recall was statistically significant for slower pupils only.

(vi) There were no differences in performance when talk-back facilities were made available, though children appeared to enjoy hearing answers from the other rooms. When multiple classes were being taught, the two way sound system became difficult to operate.

(vii) When receiving rooms were remote from the lesson production centre, the multiple role of television teacher/producer/

technician was not successful. Adjustments to sound and picture levels were impossible under these conditions.

(viii) Supervising teachers needed adequate lesson notes, possibly supplemented by follow-up suggestions, to consolidate presented material.

SECTION II. ENGLISH.

One aspect of English teaching in schools which is receiving consideration, at the present time, is the encouragement among pupils of intensive writing. There is "a new emphasis on the need for expression, but the expression of a lived experience with the emotions, the imagery, and the words that are the child's". (Langdon, 1961; p. vi). Objects and situations are presented in such a manner that pupils are motivated to verbal expression of their subjective emotional experiences.

The series of three English programmes was designed to stimulate intensive writing through the presentation of material likely to evoke a desired emotional response. Two of the programmes, namely, "On Fish" and "The Shape of a Story" were separately evaluated and are discussed in chronological order of presentation in Experiments I and II respectively. The third programme, "Fear and Joy" is not reported in detail. The experimental design, presentation of subject material, and statistical treatment of results were similar to those employed for the transmission "On Fish". Reference is made to the results of the unreported experiment during discussion of the other two programmes.

EXPERIMENT I

Subjects. An experimental and control group each of 36 pupils were selected from School A. An additional experimental group of 25 pupils from School B was also incorporated into the experimental design.

A preliminary administration of standardised tests established comparability among groups of general scholastic ability, achievement in English and age levels. Scores were obtained from the National Foundation for Educational Research Secondary Verbal Test I and the Schonell Diagnostic English Tests I and III combined.

Pre-test data were analysed using Analysis of Variance techniques. No statistically significant differences were found between groups on the three variables.

Control and television lessons were delivered by the Head of the Department of English in School A. She had not previously taught any of the three classes.

Conventional Lesson. The control group received a carefully prepared demonstration type lesson. Teaching aids included for visual stimuli a bowl of goldfish and a dead mackerel. A gramophone recording of appropriate selections from Saint-Saens' "Carnival of the Animals" was also used, and extracts from poems were read aloud by the teacher. Pupils were very interested in the lesson and participated fully with questions, short anecdotes and spontaneous comments on shape, colour and texture of the fish. As more material was presented than would be practicable under normal classroom conditions, the lesson extended 10 minutes beyond the 35 minutes allocated for a class period.

Television Lesson. Both experimental groups received the 20 minute television programme in their own schools. Lesson material was almost identical to that presented to the control group. The supervising teacher and the observer in School A reported on their evaluation sheets that sound and picture reception were fair. All children appeared interested in the programme with most displaying great interest.

The supervising teacher in School B recorded that both sound and picture reception were unsatisfactory. However, she thought that most children were very interested and all concentrated within the limits of the transmission.

No recapitulation or extension of the programme was done as follow-up in either of the experimental groups.

Results and Discussion. All classes were instructed by the teacher to submit two pieces of writing as weekend homework. Children were expected to complete (a) a short narrative involving fish, and (b) a piece of intensive writing with fish as the subject.

Two scripts from each child were individually assessed by three independent judges on the customary 12 point school scale from A to E. As the maximum mark of A and the minimum of E were never allocated, the remaining distribution of A— to E+ was converted to an 11 point scale extending from 10 to 0. Scores for both pieces of work were added to yield a possible total of 20. When the marks for the three evaluations were combined, a grand total of 60 constituted the maximum achievement possible.

As some of the children comprising the original groups in School A were either not present for the programmes, or did not submit homework, numbers within each class were reduced to 28. Pre-test data were therefore re-analysed using the following information from control and television groups in School A (N=28), and the television class in School B (N=25), respectively. I.Q. 111·32; 111·43; 112·82. English Ability 86·46; 86·86; 85·56. Age 11·93 years; 11·95 years; 11·98 years. No statistically significant differences were obtained among the means of the reduced groups.

Data from homework submitted were subjected to Covariance Analysis with scores adjusted for English Ability differences as previously measured by the Schonell Tests. The analysis employed has the advantage of removing from final scores any variations due to initial differences in English achievement among pupils, so that only the effects of experimental variables are investigated. In this way it is possible to look at the effects of conventional or television teaching after initial differences in English have been removed from children's final scores.

The effectiveness of Covariance Analysis in adjusting final test means, so that real differences due to experimental variables are exposed, was dependent, in this experiment, upon an assumed correlation between the Schonell Test scores and final English marks. In fact, the obtained correlation was not high enough to produce a significant difference. It is probable that performance on formal English tests and imaginative, "creative" writing, involves independent psychological factors. On the other hand, there are statistical explanations for the apparent lack of predictability. Among these is the relatively narrow range of achievement of the groups selected for experimental purposes. Under this condition it is often difficult to obtain high correlation coefficients even when an acceptable estimate is possible using a wider range.

In view of the above, the final adjustment of mean scores showed little movement from original estimates. For the experimental classes in School A and School B, and the control group in School A, they were, after adjustment, 33·66, 33·04 and 31·25 respectively. Although the estimates indicate a slight superiority of the television classes over the conventionally taught group, this difference was not significant at the pre-determined 5% level of confidence.

Inspection of scripts revealed that several children from each group had submitted incorrect exercises. Some wrote a second narrative or simply listed adjectives. The use of the words "intensive writing" was apparently new to some who, consequently, did not comprehend homework instructions. A Chi-Square Analysis between classes and correct/incorrect scripts established that there were no significant differences among groups in the number of incorrect exercises submitted. Teachers unofficially requested that they receive information on programme content prior to the transmissions so that new terminology could be introduced to viewing classes. However, as the control group also experienced this difficulty, it would appear either that more adequate lesson preparation was needed or that follow-up work after assessment of scripts was called for. Supervising teachers did clarify homework requirements in a succeeding classroom lesson and the problem did not arise in subsequent experiments. Teachers' requests for information prior to programmes was also noted, and before further English transmissions a verbal summary of programme content was issued.

An interesting result was obtained when the frequencies of pupils not submitting homework in control and experimental groups in

School A were compared. After allowance was made for absentees through illness and other causes, it was found that 28 pupils from the experimental group and 35 from the control group had handed in work. The χ^2 estimate of 4·7778 revealed a disparity between expected and obtained scripts statistically significant beyond the ·05 level. A significantly greater number in the experimental group had omitted to hand in the set work. As both groups were instructed to give their homework to the television/control group teacher, it can be assumed that an extraneous variable was operating when the viewing group was less conscientious in fulfilling this requirement. This result is consistent with pupils' opinions expressed on the "Attitude to Television" scale, where pupils intimated that television lessons did not constitute "really good school work". Apparently they had yet to learn to take television instruction seriously. In subsequent programmes children were firmly instructed to complete set tasks and the anomaly did not occur again.

The conclusion in this experiment must be that there was no real difference in achievement between the control and experimental groups.

Both television viewers and conventionally taught pupils received instruction from the same teacher. All groups experienced the novelty of receiving carefully prepared and highly illustrated lessons. On these variables, therefore, there was no differential among groups.

A relevant consideration is that the television classes performed slightly better than the conventionally taught pupils, even when the latter received a lesson considerably longer, and more carefully prepared, than is usually possible under classroom conditions. In this experiment television groups, without supplementary follow-up work from the classroom teacher, and with a shorter period of instruction, achieved favourable performance levels compared with the conventionally taught group.

The trend towards the superior performance of the television groups in the present investigation was supported and confirmed by results of the programme "Fear and Joy". In the latter experiment, which was identical in design and analysis to the one at present under discussion, both television groups achieved statistically superior results to the control group. An additional variable, however, was introduced. Supervising teachers were requested to carry out follow-up work to clarify and consolidate information presented in the programme. It has been noted in other reported experiments that television instruction, augmented by follow-up work, leads to better performance of viewing groups. There is little doubt that this was a determining factor in the success of these English programmes also.

Conclusions.

(i) No significant differences were registered in performance of conventionally taught and television groups when all received carefully prepared, highly illustrated lessons.

(ii) Identical instruction was given to television classes in a considerably reduced period of time compared with conventional classroom presentation.

(iii) When television instruction was supplemented by teacher follow-up work, viewing groups achieved statistically superior performances to a control group.

Experiment II

For the evaluation of the final programme in the English series, control and experimental groups comprised 31 pupils each. Both groups were from School A.

Children had previously been allocated to the two groups so that comparability of mean age, English ability and intelligence, was established. Mean scores for control and experimental groups respectively on these variables were: Age 11·9 years; 11·9 years. English Ability 86·5; 85·9. I.Q. 110·4; 110·7.

One teacher taught both classroom and television lessons. The title of the lessons was "The Shape of a Story". For illustrative purposes the nursery rhyme "Jack and Jill" was used. The teacher first drew attention to the development of the plot towards the climax. Thus the outline, or framework, of the story was established. She then proceeded to investigate the possible detail within this framework. The physical environment in which Jack and Jill lived was discussed; speculation was made on their possible appearance; reasons for the necessity to make the journey were presented. Both face to face and television lessons followed the same pattern.

Conventional Lesson. The control group lesson was well prepared with the incorporation of interesting visual aids. Cut-out cardboard figures of Jack and Jill were shown, and life-sized drawings of heads with varying facial expressions were displayed. The teacher also used the blackboard freely to illustrate the hill, the ascent and the fall. Children were very interested, but appeared to become a little tired and restless towards the end of the lesson. This reaction may have been the result of two factors. Firstly, although there was a plentiful supply of appropriate visual material, the lesson, towards the end, took the form of a lecture. Questions were not invited from the class and comments were discouraged with the request that they be incorporated into the homework requirements. Secondly, and this proposal is not independent of the first, in order to present all the prepared material, the teacher had to extend the lesson to 40 minutes. It seemed that this period was at least 10 minutes too long for the attention span of this age and ability group.

Television Lesson. Essentially the same subject matter, visual aids and method of presentation were used in the television lesson, but additional supplementary visual material was also included. The lesson lasted approximately 20 minutes, half the duration of the conventional lesson. Both the supervising teacher and the observer reported that sound reception was good, but the picture was unsatisfactory. In fact, the screen was intermittently blank for a considerable part of the programme. It was therefore necessary for the technician to remain in the classroom during most of the lesson to attend to the set. The supervising teacher, who had received some preliminary information on programme content, moved to the blackboard and tried with considerable success to follow the verbal directions of the television teacher. Children appeared to accept the blackboard summary and continued to follow the work of the classroom teacher even when the picture re-appeared on the screen.

Results. Both the teacher and observer reported that, on the whole, most children appeared very interested in the transmission until the interruptions occurred.

Homework requirements for both groups were to expand the nursery rhyme "I Had a Little Nut Tree" with pupils assuming the identity of the character in the story.

Scripts were assessed by three independent judges after collaboration with the television teacher to ascertain dimensions of judgements. Evaluations extended over the range A— to E+. These were converted to the 11 point scale of 10 to 0. Covariance Analysis techniques were used with obtained means adjusted for initial attainment on the Schonell English Tests.

No statistically significant difference was registered between the adjusted means of the control and experimental groups (18·64; 17·28), though a reversal in magnitude occurred compared with obtained averages in the other two experiments. In both English Experiments I and III the television groups achieved higher mean scores than the control class, and in Experiment III this difference was highly significant. In the present experiment it can be assumed that the reversal was due to technical failure of the television set.

Discussion. Further tentative conclusions may be drawn from observed teacher and pupil behaviour during the lessons. Firstly, it was noticed that the teacher, in the control group lesson, tended to adopt television techniques when the amount of material to be presented proved excessive for the period. This procedure may have depressed, somewhat, the performance of the control group. Positive and negative transfer between television and usual teaching methods, in both directions, had been observed during other experiments. It is inevitable and often desirable that this should occur, particularly during the early stages of experimentation. The argument is not that teachers should restrict their role to television teaching or the classroom. On the contrary, there is evidence from other research that carry over is often extremely valuable, and that good classroom teachers become good television teachers. A considered opinion, based on the success of the Music programmes, is that, if possible, contact with the classroom should be maintained by television teachers. Judgements of time intervals necessary for pupils to pick up pencils, arrange work sheets and complete exercises may be considerably distorted under studio conditions. The problem is one of selection. Though there are many elements common to both media, individual procedures should be adopted to conform to the different requirements.

In the present experiment, the teacher was undoubtedly forced to resort to the lecture method of instruction by the pressure of covering a prescribed area of material. The evidence is conclusive that, with the time variable held constant, far less material can be presented during a conventional lesson compared with a television transmission.

A third point considered worthy of comment was the ease with which the supervising teacher assumed control of the lesson during picture failure. Previous experience as a supervisor proved useful during this emergency, and the lesson was continued most effectively.

Children, on the other hand, had by this time in Phase III, become fairly sophisticated viewers. When technical difficulties arose, they rejected television in favour of their classroom teacher. This reaction could have been partly due to the highly visual nature of the programme. Unlike the Religious Education transmissions, which were predominantly verbal, the present programme depended on its visual impact to hold pupil interest.

Conclusions.

(i) A slight, though statistically insignificant, difference was recorded between control and experimental groups in favour of the conventionally taught class when the television was technically below standard.

(ii) Some transfer was evidenced between television and conventional methods of instruction. Appropriate adaptations, in both directions, are recommended for optimum learning conditions.

(iii) The supervising teacher, who had acquired experience in previous lessons, successfully integrated prior information on lesson content with television material.

(iv) Children rejected television in favour of instruction from the supervising teacher when technical difficulties arose.

SECTION III. RELIGIOUS EDUCATION.

One of the more important aspects of the evaluation of educational television is the measurement of its impact on the attitudes of pupils. Recent reviews (Holmes, 1959; Schramm, 1962) have cited contradictory evidence. Some studies, for example, Myers (1961) and

Westley and Jacobson (1963) report that television was equally as effective as classroom instruction, or more so, in modifying attitudes and in the formation of new concepts and values. Others (Bobren, 1960) have found television less successful. One of the traditional aims of British education, particularly in the field of Religious Instruction, has been the inculcation of Christian value systems. The aim of the present experiment was to determine whether acceptable attitudes could be developed through closed-circuit television.

The hypothesis, based on the results of prior investigations, was that the dissemination of information would extend the concept of charity among pupils. A predetermined assumption was that a positive extension would have occurred if children ranked their idea of charity as a state of mind above charity as the distribution of material goods or church attendance.

It was further hypothesised that, with increased information and understanding, a positive change in attitude towards charity would be effected.

Experimental Design. A fourth year group of 31 County Secondary School pupils of above average educational ability were selected as subjects for the experiment. All pupils were surveyed on their attitudes towards charity both before and after the transmission. Before the start of the series of three programmes, a Likert type "Attitude to Charity" scale expressly constructed for the experiment was administered to each pupil. The scale contained eight pre-tested sentences of the following kind:—

> "Charities are worthwhile."
>
> "It is a waste of time being charitable to some people."

Pupils were asked to indicate whether they strongly agreed, agreed, were undecided, disagreed or strongly disagreed with each statement.

In addition, children were given three sentences to arrange in descending order of approximation to their idea of charity. Statements were:—

(a) Charity is going to church.
(b) Charity is love, understanding and tolerance.
(c) Charity is giving goods or money.

At the end of the programme series pupils were again instructed to complete the attitude scale and to rank the three concept statements. They co-operated willingly.

Programmes. Programmes in the series were separated by time intervals of one month. Information was presented in discussion form with the Head of the Department of Religious Instruction interviewing visiting speakers. Programme I introduced the concept of forgiveness as an act of charity. The parable of "The Prodigal

Son" was used for illustration. However, it was found during the subsequent follow-up group discussion that many children had little or no knowledge of this Biblical reference. The need for some preliminary class preparation was apparent. Both the supervising teacher and observer agreed that the interest level of most children was high, with several taking notes without encouragement from the teacher.

The second transmission was similar in presentation to Programme I. Activities of charitable organisations such as Oxfam were discussed. Most children appeared very interested, but it was reported on the lesson evaluation form filled in by the supervising teacher during the transmission that the more intelligent child seemed to have a greater appreciation of the programme.

Both the supervising teacher and an observer reported independently that, when the picture was lost during the third quarter of the programme, through a technical fault, there was little reaction from pupils, who continued to listen attentively. Apparently visual information was at a minimum, after introduction of the speakers, in this type of programme, where communication was predominantly aural.

The final programme introduced the responsibilities of the courtship relationship and its evolution to the institution of marriage. Pupils appeared very interested, though their usual classroom teacher reported that "they are not as interested, as yet, in boy-girl relationships as some other groups—these still find their school work and club activities sufficient emotional outlet. They are, therefore, listening but without feeling a great involvement."

Results. Twenty-nine of the original 31 pupils were present for both testing sessions. Data from these subjects were analysed to determine:-

(a) Whether their concept of charity had been extended.
(b) Whether their attitude to charity generally showed some modification in a positive direction.

Kendall's Coefficient of Concordance was used to analyse the community of preference among pupils' rankings of the three statements. The analysis of pre-test data revealed a high degree of communality among children's concepts. The statistical estimate was highly significant ($w = \cdot75$, $z = 2{\cdot}22$; $p < \cdot01$). Sixteen pupils ranked "love, understanding and tolerance" first, while the remaining 13 placed this statement second. All pupils thought "churchgoing" most remote from their idea of charity. The post-test analysis yielded similar results ($w = \cdot78$ with $p < 01$). As the higher w estimate indicates, the communality of judgements of the 29 pupils had increased. A frequency count established that 22 of the total of 29 subjects had ranked "love, understanding and tolerance" first.

Four reversals occurred among pupils who had originally given priority to the latter statement. In the post-test situation, they placed "giving goods or money" closest to their concept of charity. It would appear that these pupils had failed to comprehend the underlying principle that economic generosity should be consequent upon a sympathetic attitude. There was one reversal only between "churchgoing" and "giving money or goods". This pupil ranked "love, understanding and tolerance", "churchgoing" and "giving goods or money" first, second and third respectively.

Data from the two administrations of the "Attitude to Charity" scale were analysed by the "t" test for identical groups. No significant change in attitude was registered. In fact, inspection of individual scripts established that there was practically no movement at all from original scores.

Conclusions. Previous studies have emphasised the difficulty of modifying preconceived attitudes, particularly when an intellectual approach is employed. A lowering of the resistance threshold is often dependent upon the arousal of an empathic reaction within experimental subjects. The comment of the teacher that children listened but did not register any great emotional involvement, appears acutely relevant in view of the results of this section of the experiment.

Although the registered extension of the charity concept indicates that there is a place in television for discussion type programmes, previous research evidence (Skurnik, 1965) suggests that concrete illustrations are usually more powerful than abstract ideas. A dramatised presentation, or alternatively, a narrative method using a single speaker, might prove more effective in inducing immediate attitude changes. There is, of course, a possibility that information acquired during the series could be instrumental in modifying attitudes in the desired direction in future years, when the experience of children has been extended to include the practical situations discussed.

SECTION IV. MUSIC.

A series of six music programmes was sub-divided into two sections for purposes of experimental evaluation. Part I comprised three programmes planned to yield an estimate of information gain and its subsequent application. The performance of television viewers was compared with that of pupils taught by conventional methods. The three programmes in Part I were entitled:-

(i) "Instrumental Instruction—the Violin".
(ii) "Setting words to Music—Part I."
(iii) "Setting words to Music—Part II."

As the results of each programme in the sub-sections were individually analysed, reference will be made henceforth to Experiments I, II and III respectively.

The remaining three programmes were grouped within Part II. The aim of this section was to investigate the cumulative effect of three enrichment type transmissions on pupils' attitudes towards Music. Programmes were "A Study of Bartok", "The Role of the Conductor" and "The Study of Musical Form". This sub-section constitutes Experiment IV in the series, but is not reported here as an independent experiment. Results of these latter programmes are included among general comments in Chapter 5 "Discussion and Conclusions".

EXPERIMENT I

Subjects. Two comparable groups each of 35 first year entrants within the same school were selected for experimental purposes. The groups had been carefully matched prior to the experiment for age (average 11·9 years), intelligence, academic achievement and home environment. As there was a limited number of instruments available, 17 pupils were randomly selected for investigation from each of the two classes. One group received instruction via television with follow-up work carried out in the viewing room by a non-specialist teacher. The matched group received identical information and similar but reduced instruction by conventional methods.

The same specialist teacher was responsible for the original planning and delivery of both classroom and television lessons.

Conventional Lesson. During the conventional classroom lesson, at which the experimentalist was present as an observer, the total group of 35 pupils was expected to attend while the teacher gave demonstrations in the handling and elementary playing of the violin. The 17 children with instruments practised under his supervision while the remainder looked on. A class period of 35 minutes was necessary for the teacher to cover the selected area of information.

Television Lesson. The television lesson was received in the classroom by 35 pupils supervised by one non-specialist teacher with some knowledge of music. The experimentalist was again present as an observer. All children were instructed by the supervising teacher to watch the screen carefully. The 17 issued with instruments prior to the beginning of the programme were encouraged, advised and corrected by the teacher, who moved freely among them. At the termination of the 16 minute transmission, pupils with instruments were requested by the teacher to lend them to the other half of the class. He then repeated with these pupils as much of the programme as he could recall. The original group listened and gave help to their neighbours. A large proportion of the programme content was revised in this manner.

Results. Since the individual testing of 17 pupils' retention of information proved too time consuming for the television teacher, numbers were randomly reduced to eight from each of the control and experimental groups. Testing was carried out in the following areas: holding violin to chin, placement of left hand, plucking of "A" string and "D" scale, playing a tune, positioning of three fingers.

Raw data were analysed by the application of Student's "t" test for independent samples. A statistically significant difference was obtained between the means of control and experimental groups in favour of the television viewers ($t = 3{\cdot}5070$; with 14 d.f., $p < {\cdot}01$). The conclusion is that the television group learned and applied information more effectively than the conventionally taught pupils.

Both the supervising teacher and observer reported on their lesson evaluation forms that all children in the television classroom were interested and participation was spontaneous and complete. The supervising teacher submitted the following general comment: "As regards participation—far from encouragement being needed, restraint was, in fact, required even before the programme began owing to the presence of the violins which were a great novelty to most". Similar enthusiasm had been exhibited by members of the control group. In both groups, boys were no less interested than girls.

Discussion. There is little doubt that the active contribution of the supervising teacher was at least partly responsible for the success of the transmission. Previous studies (Schramm, 1960) have emphasised the value of television used as a teaching aid supplemented by follow-up work. Revision and consolidation of material is possible and, indeed, essential when the content of a 35 minute lesson can be presented in half that time using television as the communicating medium.

The number of pupils studied was small. However, as selection of subjects was at all times random, it can be assumed that, in this experiment, television instruction supplemented by follow-up work from the supervising teacher resulted in a real superiority of achievement for the television group compared with the performance of pupils taught by conventional methods.

EXPERIMENTS II AND III

The mutual aims of Experiments II and III were threefold:-

(i) To compare the performance of television viewers receiving instruction in setting words to music with the performance of children taught by conventional methods.

(ii) To investigate the effect of television teaching on children in a linked school.

Results. Since the individual testing of 17 pupils' retention of information proved too time consuming for the television teacher, numbers were randomly reduced to eight from each of the control and experimental groups. Testing was carried out in the following areas: holding violin to chin, placement of left hand, plucking of "A" string and "D" scale, playing a tune, positioning of three fingers.

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(ii) To investigate the effect of television teaching on children in a linked school.

(iii) To study the outcome when the television teacher was known personally to members in one receiving class and unknown to pupils in another.

Subjects. Three classes each of approximately 30 first year secondary school pupils were selected to participate in the experiments. One viewing group and one control group came from School A, while a second television group was selected from School B. A preliminary testing programme established that there were no significant differences in age or scholastic ability among the three groups. Pupils in both classes in School A had received some instruction from the television teacher, who was also their classroom teacher, prior to the commencement of the experiments. The group from School B did not know the television teacher and had received no preparatory lessons.

Setting Words to Music—Part I

Conventional Lesson. The Control group lesson on "Setting Words to Music—Part I" had been carefully prepared with blackboard work completed before the lesson began. Pupil participation was encouraged during the 35 minute period.

Television Lesson. The two experimental classes received the same 20 minute programme in their respective schools. Children in both groups were issued with work sheets at the beginning of the lesson. A non-specialist teacher supervised the School A group. No follow-up work was carried out in this class. In School B, the specialist music teacher in charge revised salient points at the end of the programme. Both supervising teachers reported that children's participation in the lesson was spontaneous and orderly. Pupils were not disturbed by the instruction from the television teacher to pick up their pencils and to work on the forms provided. Considerable care was exercised by the television teacher in directing, anticipating and controlling the activities of the children. Most worked industriously at a consistently high level of interest.

Results. Homework was set by the television teacher and submitted for correction on the day following the lessons. A total mark of 10 was allocated for: phrasing, phrase endings, timing and bar lines, originality.

Inspection of collated raw data revealed that scores for the three sets of results did not discriminate among the better pupils at the higher end of the range. As this phenomenon had the effect of differentially reducing the variance within groups and of invalidating the basic assumption of normality of distribution, the customary parametric statistical technique of Analysis of Variance could not be applied. The less powerful, but more appropriate Median Test for multiple samples was therefore employed in the analysis. The resultant χ^2 of 10·35 was significant beyond the 1% level for 2 degrees of freedom. Thus there was less than one chance in a hundred that the distribution of pupils' scores within the dichotomy formed by the median could have arisen through chance factors.

Discussion. Inspection of the contingency table revealed that the differences between the expected and obtained frequencies of the control and experimental groups in School A made the largest contribution to the Chi-Square estimate. An interpretation of the contribution is that:-

(i) The control group performed less successfully on the test than either of the two experimental groups.

(ii) The television class in School A achieved higher scores than the television group in School B.

It would appear, therefore, that in School A, information presented on television, in a reduced period of time, and without follow-up, resulted in more accurate subsequent application than similar information presented by conventional methods. A comparison of the performance of the control group in School A and the experimental group in School B leads to the conclusion that with follow-up the television viewers achieved higher scores than members of the control group, even though the viewers did not know the teacher and had received no preparatory instruction on the subject of melody writing.

The superiority of the viewers from School A over those from School B may have been due to the preliminary instruction received by the higher scoring group. This tentative conclusion is justified from an inspection of the results of Experiment III, where no difference was registered between the two classes. It is possible that one lesson supplied sufficient information to the children in School B for them to catch up with those in School A. On the other hand, the improved performance of the School B group could have resulted from the fact that the television teacher was by this time known to the children.

Setting Words to Music—Part II

An experimental design similar to that employed in Experiment II was utilised for evaluation of the programme "Setting Words to Music—Part II". The same control and experimental groups from School A and the experimental group from School B participated.

However, in the present experiment, instruction time was equalised for the three groups, each of which was taught for approximately 25 minutes. An additional variable was introduced when the television teacher set and corrected exercises for the viewing groups for 15 minutes at the end of the instruction period. Members of the control group were given exercises to complete on their own at home. The temporal extension of the television lesson was designed to investigate the following area. Could an experienced teacher conduct a successful lesson, complete with instruction and consolidating exercises, via the television medium ? A successful lesson was defined as one in which children acquired an acceptable body of information, pacing was appropriate for child participation, and discipline by means of concise and accurate instructions was primarily the responsibility of the television teacher once the attention of the class had been established. In short, the additional variable was introduced to determine how much the children would learn and whether a high interest level could be maintained under the exceptional conditions of programme longevity and minimal classroom supervision. In terms of Barrow's "Proposed Theory for the Effect of Educational Television" (1960) the experimental procedure was designed to investigate the comprehensibility (Co) and potency (Po) of the televised message.

Conventional Lesson. The 25 minute control group lesson was delivered in a conventional manner. Blackboard illustrations were prepared prior to the lesson.

Television Lesson. Members of both experimental groups received the one television lesson in their respective schools. Children were issued with work sheets and supervised by the two teachers who took part in Experiment II. Direct instruction occupied 25 minutes of the 40 minute programme. The final 15 minutes were devoted to the application of information presented. Exercises were completed and corrected in class under the direction of the television teacher. Homework was also set with the instruction that it be submitted for correction the following day. A total of 20 marks was allocated for: phrase endings, metre of last line, general originality, treatment of two syllabled words.

Results. After collation of data, numbers within groups were equalised for ease of computation, using random numbers. Twenty-four children were selected from each group giving an overall total of 72. An Analysis of Variance was carried out ($F = 6{\cdot}2369$; for 2 and 69 d.f., $p < {\cdot}01$), followed by Duncan's Multiple Range Test to determine which varietal means were, in fact, significantly higher.

The analysis established that both experimental groups achieved significantly better scores than the control group, with a probability of chance factors operating to determine the result less than one in a hundred. No real difference was evidenced between the performance of the two experimental groups.

Discussion. The result is consistent with that obtained in Experiment II, where the experimental groups performed more efficiently than the children taught by conventional methods, even though the control group had received a longer period of instruction.

In the present experiment the temporal extension of the television lesson apparently did not cause a fatigue or boredom factor to operate and to interfere with the learning process. This conclusion is substantiated by the evaluations of class reactions submitted by supervising teachers, who reported that children participated spontaneously in both experimental classes and appeared greatly interested. In view of the report that programme reception was only fair in School B, the potency of the programme content can be assumed to have reached a high level.

It is emphasised that the success of a 40-minute programme of the kind employed in this experiment may be dependent upon two major factors. Firstly, the transmission was carefully planned so that pupil participation was both psychological and physical. Secondly, the television teacher was primarily a classroom teacher, a music specialist, with a sensitive appreciation of pupil needs and the trained ability to gauge timing requirements accurately. It is hypothesised that the effective use of television as a teaching device without augmentation by classroom follow-up work is concomitant with the preceding conditions.

Conclusions. Results of Music Experiments II and III point to the following conclusions:-

(i) In both experiments, the performance of television viewing groups was significantly superior to that of a matched control group.

(ii) In Experiment I, the television class in the parent school achieved higher scores than viewers in a linked school.

(iii) In Experiment II, a successful 40-minute lesson, complete with instruction, recapitulation and follow-up exercises was taught to viewing groups in each of two schools via the television medium.

SECTION V. ART.

One of the aims of the Objective Assessment was to investigate the effect of introducing carefully prepared and rehearsed programmes into the normal school curriculum. These programmes were collectively called the "Motivation Series". Art was among the subjects studied.

The series was designed to include a more extensive range of material than is usually possible under classroom conditions. In addition, an attempt was made to approach subjects from a slightly different angle. Content and presentation of programmes were, in some respects, original and dependent upon conditions exclusive to the television studio. For example, the amount of time needed for preparation of programmes was considerable. Illustrative material included large reproductions of wall paintings as back-drops. Special camera techniques permitted enlargement of details, textures and processes.

The first experimental hypothesis was that children's interest in a particular subject, namely Art, would be stimulated by a relatively novel approach. An assumption was made that the heightened interest level would result in more positive attitudes towards the subject area generally.

A second hypothesis was also formulated; if the desired changes in attitude were registered, the performance of the television groups in end of term school tests would likewise be enhanced. The second hypothesis was based on the further assumption that some correlation exists between interest level and achievement.

Subjects. A group of 57 third year County Secondary School pupils from School A were allocated by the use of random numbers to a control or experimental group. The control group contained 27 pupils, while the television group numbered 30.

Two intact, unstreamed Grammar School classes were selected from School C. Pupils in all groups were from the same age group (approximately 14 years). Achievement scores in Art for the 1964 school examinations were obtained for all groups. No statistically significant differences existed between control and television groups in either School A or School C. Inter-school differences were not examined as it was neither relevant nor possible to establish comparability of standards of assessment between schools.

Tests. Before transmission of programmes, a 48 statement Thurstone-Chave type "Attitude to Art" scale was administered to the four groups. The scale was previously constructed in the usual manner with scale values pre-tested for reliability. Two examples of relatively extreme statements are:—

"I think that Art is the best subject we have in school."

"Whenever I have to draw or make things for Art I am very bored."

Instructions to all groups were standardised. They were printed on the first page of the scale and read aloud to each group by the one experimentalist. Children had to indicate whether they agreed or disagreed with each statement.

At the end of the series of programmes the attitude test was re-administered to the four groups.

Lessons. Control groups continued their usual classroom activities during the experimental period.

Four programmes on the History of Art were received by the television groups during a period extending over seven weeks. In order of presentation programmes were "Prehistoric Art", "Egyptian Frescoes", "Mosaics" and "Print Making".

Each of the transmissions lasted for at least 30 minutes. As programme presentation was carefully planned and rehearsed, a considerable amount of information was covered during the period.

In School A the supervising teacher and observers reported on their lesson evaluation forms that most children appeared very interested in the lessons. During the final programme on "Print Making" all children were greatly interested. The supervising teacher, who was himself an Art specialist, reported that both he and pupils thought this was the best of the Art series. Some interesting comments on presentation were also received for this programme from the supervising teacher. "Children were very interested in the practical—how to do it—sections. This lesson also scored because black and white television could cope with the subject. Also for long periods we had a sense of scale—a person's hands were on view." The question of scale was mentioned in an evaluation of the "Frescoes" programme where pupils were not aware of the immense size of the Egyptian wall paintings. This misconception was corrected during follow-up discussion.

A further comment frequently made was that children tended to lose interest slightly when the narrator appeared on the screen for more than a few minutes. Long verbal introductions, explanations and conclusions did not hold their attention. The classroom teacher reported that pupils were more interested in processes and products in Art than in the verbal history. The intense concentration of the children when methods employed at different periods in history were demonstrated was quite marked.

As in other previously reported experiments it was noted that, at times, incorrect assumptions were made regarding children's familiarity with terminology and place names. Though infrequent in this series, such comments again point to the need for fairly comprehensive teaching notes.

Teacher follow-up work took two forms in School A. Discussion immediately followed the programmes, and relevant practical work was undertaken in subsequent lessons. Children were obviously stimulated to ask questions demanding more detailed information, and to experiment with the processes they had viewed.

In School A sound reception was good for all programmes. The picture was fair for the first three lessons in the series and good for "Print Making".

Little information was available on pupils' reactions from School C. This school was remote from the studio and parent school, and experienced technical difficulties during most of the programmes. Picture reception was only fair or unsatisfactory on all occasions. Whenever possible, the specialist supervising teacher related programme content to regular classroom activities.

Results. Covariance Analyses were carried out on the data obtained from each school. Scores from the pre-transmission application of the attitude scale were used to adjust final mean scores in relation to group performances on the initial test.

In School A the difference between the final adjusted means was not statistically significant (control = 7·44, television = 7·37).

Nor was the difference greater than could be expected through chance fluctuation between the two classes in School C (control = 7·08, television = 7·15).

Discussion. The lack of any appreciable movement in children's attitudes, as measured by the scale, could have been the result of any of a complex of factors.

Children in both schools were already receiving a high standard of varied instruction in many areas of Art. It is relatively easier to shift neutral attitudes towards a positive pole than to increase motivation among pupils who are already enthusiastic.

On the other hand, while children appeared very interested in the series, it consisted of four programmes only. Separated as the transmissions were by lengthy intervals, it is probable that pupils took them as a slight variation on their usual lessons.

Though every attempt was made in the presentation of programmes to introduce an element of novelty, on the whole this proved rather difficult in the present situation. It has been pointed out previously that Art lessons in schools involved in the experiment were already rich in variety. In addition, the supervising teacher in School A had information from previous transmissions of the programmes and had adjusted his curriculum to incorporate preparatory and follow-up work in other lessons.

It is possible that other subject areas in which the influence of television has not been felt would be more amenable to original, enrichment type presentations. However, the History programmes, which also came within the compass of the "Motivation Series", were not as enthusiastically received by pupils as the Art lessons. In the former series the difficulty level of programmes was too high for viewing groups.

Finally, attitudes are among the most difficult and nebulous psychological factors to evaluate quantitatively. Although scales were carefully prepared and their reliability demonstrated in test/retest situations, the instruments were measuring attitude to subject areas generally. This was consistent with the stated aims of the experiments, but it is highly probable that more specific and sensitive scales are necessary if all the effects of television programmes are to be measured.

Conclusions. A series of four carefully prepared, highly illustrated programmes on the History of Art were viewed by a television group in each of two schools.

No statistically significant differences were obtained between control and experimental classes on a preliminary and post-programme administration of an "Attitude to Art" scale.

PART II. CHAPTER 5

DISCUSSION AND CONCLUSIONS

The Objective Assessment was directed towards determining, within limits imposed by experimental conditions, the most effective use of closed-circuit television in the classroom. Questions posed in Part II, Chapter I were subsidiary to this general aim. To examine these queries objectively it was first necessary to formulate hypotheses amenable to experimental investigation.

Ideally, it is preferable to have access to a large parent population from which several homogeneous, random samples can be drawn. These samples then receive the same information within different methods of presentation. For example, one group would receive a normal classroom lesson; another, direct blackboard television instruction; a third, a well illustrated television lesson; a fourth, television plus teacher follow-up work, and so on. Under these conditions, one experimental design and analysis can yield results to suggest which methods are more effective for particular age or ability groups. Unfortunately, unless large schools are completely disrupted and re-organised, these ideal conditions seldom obtain.

An alternative method, which was adopted in the present investigation, is to use a standard, or criterion, common to several small experiments. The ultimate aim when using a criterion, is not to compare each experimental result with the standard, although such comparisons are inevitable, but to evaluate variations in results by means of comparison with the common criterion. In the series of experiments discussed in this report, conventional classroom lessons were taken as the selected standard. Television presentations were designed to incorporate a range of intervening variables. In this way it proved possible to examine those factors relevant to the most propitious use of television in the classroom.

Within the report, comments appear quite frequently on programme content and presentation. Wherever these occur, it is important to differentiate between facts and the interpretations of those facts. The former are indisputable, the latter, at times, merely speculative. No systematised, quantitative programme analysis, as such, was carried out during the investigation. The use of psychometric techniques, such as the Semantic Differential and Factor Analysis, has proved particularly profitable when such analyses have been made in this country and others. However, in the circumstances of the present experiment it was considered professionally undesirable to introduce the dimension of programme analysis into the investigation. All members of staff responsible for the presentation of programmes contributed on a voluntary basis. Where quotations or comments are included in the report, they arose spontaneously, in the majority of cases, from the provision made on Teacher/Observer Programme Evaluation Forms for suggestions on follow-up work.

Some aims of the enquiry were not amenable to direct quantification. For example, limitations of time obviously precluded the experimental investigation of such questions as the following: "Can an entire academic course be presented on television or should only a proportion of the curriculum time be allocated to television ?". Although no controlled experimentation was possible on this aspect of the use of television, it is anticipated that information included in this and preceding chapters will throw some light on this wide and complex question. In general, it would appear that selection of suitable subject areas, methods of presentation of material and the availability of teachers for follow-up work are more important and fundamental factors in determining children's interest levels and information gain than the number of programmes presented in a series.

In view of some overseas findings, it was anticipated that the present investigation would reveal reluctance on the part of some teachers to accept educational television, and that this attitude might prejudice their judgements. There is no evidence that this occurred. Most teachers appeared to rate reception conditions and pupils' reactions quite objectively. Evaluations were remarkably consistent among visiting observers, the experimentalist and teachers when experimental conditions were constant.

The following discussion is therefore based on information obtained from a variety of sources. Conclusions are drawn, at times, from an aggregate of teacher/observer evaluations of lessons and pupils' behaviour. Where there is some doubt concerning the validity or reliability of measurement, efforts have been made to underline the tentative nature of the conclusion.

What viewing conditions produce the greatest information gain ?

(a) There is considerable evidence that appropriately illustrated and carefully rehearsed television lessons enhance the learning process. Results of previously reported English and Music programmes support this conclusion which applies over a range of age and ability levels.

(b) Television lessons, particularly in Mathematics, had limited success when they were directed at a wider ability range than approximately 10 I.Q. points. However, when lessons were modified even slightly to exploit the visual potential of the television medium, slower pupils, especially, benefited from the adaptation.

(c) When direct blackboard teaching methods were employed, experienced specialist teachers found it impossible to vary lesson pace and content sufficiently to suit a wide ability range. It is not only a question of poorer pupils being adversely affected by this type of programme. If the ability range is very wide, as in the Trigonometry series, both slower and faster pupils do not receive appropriate instruction. It is inevitable under these conditions that a large proportion of the material will be directed at the middle of the range with excursions towards the extremes whenever it is possible and advisable. The result is that no group will be taught satisfactorily.

A conclusion is that the speed at which material is presented should vary, as it does in usual classroom lessons, to suit the needs of particular groups of pupils. In addition, the density, or number of new ideas presented, must be severely limited for academically poorer pupils. In the Trigonometry series, classes of less than 100 I.Q. average could not assimilate the three concepts of tangent, sine and cosine in one lesson. On the other hand, the supervising teacher reported that Grammar School pupils could have covered more material in the time available.

(d) Teacher follow-up work improved pupil performance whatever the original method of presentation of material. With direct blackboard type programmes plus teacher follow-up, higher ability control and experimental groups achieved comparable results. When illustrated, rehearsed lessons were followed by teacher discussion and consolidation, television groups performed better than control classes. The conclusion is that, while direct blackboard type television teaching plus follow-up work is as successful, with some exceptions, as conventional methods, the best results are obtained if material is adapted to suit the visual potential of the medium.

To what extent is physical as well as mental participation possible in television lessons ?

In all programmes, with the exception of the filmed French series to be discussed later, children, on the whole, spontaneously followed directions from television teachers to take notes, solve problems or repeat information verbally. In fact, supervising teachers reported that pupils were disappointed, at times, when instructions were given not to copy or work examples.

Successful incorporation of active pupil participation involves several considerations. On the whole, fewer difficulties arose when lessons were directed at homogeneous ability groups. Obviously children work at different speeds. Time intervals must consequently be extended or reduced for slower or faster pupils.

Participation was most orderly and successful when the television teacher controlled viewing classes with concise and appropriate instructions. The Music programmes were remarkably successful in this respect. The specialist teacher gave simple directions and accurately gauged timing requirements for picking up pencils, arranging work sheets and making responses. One important factor was that no verbal or new visual material was presented while children recorded their answers. In a few programmes, the voice of the teacher, or additional visual aids, interfered with children's attempts to concentrate. They found it difficult and disturbing to look or listen and write at the same time. In general, however, as long as the needs of the audience were kept in mind, no real problem was encountered with this aspect of the television lessons.

What is the effect of using two-way sound communication between classroom and studio ?

It proved difficult to use two-way sound efficiently under present experimental conditions. When several classes received instruction simultaneously, teachers and pupils needed suitable and practised response patterns to cope with the equipment. Unless questions were directed at a particular pupil, children responded "en masse". It was obvious that they needed direction to put up their hands, and to speak loudly when selected to reply by the supervising teacher, for their answers to be audible over the communication system. The classroom teacher, also, required practice at switching quickly through to the studio. While the channel was open from the classroom to the studio, it was closed in the reverse direction. It was therefore difficult to know, unless manipulation of the controls was reasonably expert, whether the response was correct, or had been received at all. Successful use of two-way sound under the different conditions of Phase I is discussed in Part I, Chapter 1.

The use of two-way sound was introduced in one of a series of programmes. It proved virtually impossible to isolate the effect of this variable in improving pupil performance on objective tests. There was little doubt, however, that pupils enjoyed the procedure, though the interest could have been due to the novelty factor only.

Other uses of two-way sound in the experimental situation were as follows:—

(a) If a class was unsettled at the time set for the start of a programme, it was useful to be able to call the studio to delay transmission for a few minutes.

(b) Reception difficulties were rapidly reported and the studio technician made available for adjustments.

(c) It was reassuring for classroom supervisors to know they could make direct and immediate contact with the studio in an emergency.

Although no record was kept of the frequency of use of the system, estimates, based on recall, suggest that it was quite extensively employed.

What is the optimum length of viewing time ?

Conclusions on the most suitable length of television lessons were based on results of objective tests and observation of pupils' behaviour.

Children's attention span varied with age level and type of programme. Older pupils were more willing than younger groups to watch, or listen to, predominantly verbal type programmes. Younger children became restless when the commentator appeared on the screen for more than a few minutes at a time.

In general, it appeared that 15-20 minutes was the optimum length of instruction time for all groups. Beyond this period, the amount of material presented tended to be excessive. However, there were notable exceptions to this generalisation. One of the Music programmes extended over a 35 minute period, of which approximately 15 minutes was allocated to delivery of information. The remainder of the time was spent on consolidation of lesson content through questions and exercises. The Art programmes, also, were longer than usual. These were varied, and consequently slower, in presentation of material. Also the visual interest was high.

If follow-up work was undertaken immediately after the television lesson, 20 minutes appeared to be a reasonable length. On the other hand, if revision and consolidation of material presented was incorporated into the programme, it could be successfully extended to cover a full lesson period of 35-40 minutes.

What is the value of introductory, background and fade-out music ?

The following conclusions are based on opinions of a limited number of teachers and observers. Comments, therefore, fall within the category of subjective evaluations.

Introductory and fade-out music made two contributions:-

(a) It established a sense of expectancy and finality among pupils at the beginning and end of lessons.

(b) It reinforced information presented or the mood established by the programmes.

In the former situation, it was reported that music regularly employed during a series of programmes provided a substitute for the usual remarks of teachers to "Sit up and pay attention!", or "Look this way!", and "That's all for today!" Four recordings of French cafe music were used effectively in this way for the series of filmed French programmes.

For the Religious Education programmes on mental health comprising the series "How Free Am I ?", a popular song was selected to introduce and conclude lessons. It proved particularly effective. Both melody and rhythm were attractive to young people, and pupils listened thoughtfully to the words which had considerable relevance to programme content.

The effectiveness of background music within programmes was varied. During the English programme "On Fish", music and a voice reading verse extracts were transmitted simultaneously. In this context music constituted a form of internal interference and was a distraction. It was difficult to listen to two forms of auditory stimuli at the same time. According to teacher/observer reports, the result was unsatisfactory.

On the other hand, in the programme "A Study of Bartok", music was most effectively used to reinforce the visual image of the composer.

It would appear that the auditory contribution of music within a programme should be limited to the reinforcement of visual information. Care should be exercised in presentation to avoid internal interference in both the auditory and visual spheres.

How effective is television in modifying socially determined attitudes ?

There was no evidence from the two Religious Education series on charity and mental health to support the hypothesis that discussion on television can modify pupils' attitudes. The negative result may have been due to the predominantly verbal, intellectual style of presentation of programmes. It is suggested that concrete examples might prove more successful than abstract generalisations.

It was observed during the series on mental health that pupils displayed great interest in the visual aids. In one of the programmes the visiting speaker held tablets and handcuffs and explained how the former had replaced the latter in the treatment of mental illness.

Although children retained a considerable proportion of the information presented, their immediate attitudes towards the concepts remained unchanged. It is possible that modification to attitudes could arise in the future as a consequence of the increase in information.

What is the effect of the teacher being known/unknown by viewers ?

Comparisons between performance of pupils in the parent and linked schools suggest that, in general, differences were not significant. Where statistically admissible discrepancies occurred, they could be interpreted, in the majority of cases, as resulting from technical failures in the linked schools. In addition, programmes originating in the studio tended to be more closely integrated with customary curriculum activities in the parent school. For example, in Music Experiment II, a statistically significant difference was obtained between the experimental group in the parent school and the television class in a linked school. In the third Music experiment, this difference had disappeared. Although it is possible that the determining factor was that, by this time, the teacher was known, it is more probable, in view of results from other experiments, that preparation given to pupils in the parent school prior to presentation of the first programme was responsible for their superior performance.

Although children appeared to like seeing their teachers on television, there is no evidence that learning is significantly improved when teachers are personally known to viewers.

What is the place of note-taking in television lessons ?

At the beginning of Phase III it was apparent that many pupils still regarded television lessons as a form of entertainment. As the investigation progressed, active pupil participation included written responses to questions and the solution of examples under the direction of the television teacher. Habits formed in these structured situations carried over to other programmes. Some pupils continued to take notes in subsequent lessons without direct instruction or prompting from the television or supervising teacher. This practice was by no means universal. However, it underlines the ease with which behaviour patterns are formed and their subsequent generalisation.

Although note taking apparently involves few problems for some pupils, there are times when the practice may need to be carefully controlled. Older pupils (14-15 years) took notes spontaneously during some of the Religious Education programmes. These lessons assumed a discussion form where a limited amount of visual information was available. Note taking did not appear to interfere to any appreciable extent with comprehension of material. On the other hand, it is suggested that when highly illustrated lessons are presented, it is preferable to control note taking, particularly among younger pupils. Time should be made available, perhaps supported by captions, for them to record salient points of the programmes.

Do enrichment type lessons stimulate the use of other source material ?

There is evidence from teachers' reports of the Art enrichment lessons that pupils were stimulated to ask questions demanding more extensive and intensive information on the series. Children were also anxious to try out processes for themselves and to experiment with new media. Fortunately, there was opportunity for the gratification of these interests. Staff in Art Departments in viewing schools were well qualified to carry out relevant follow-up work. In addition, the curriculum in one school had been adjusted, as a consequence of previous transmission of the programmes, to include related methods.

The series on Local History was not as effective as the Art programmes in stimulating further pupil activity. These programmes tended to be too difficult for selected viewing groups. School and local libraries reported that no requests for further information were received from pupils.

Although the Religious Education programmes were not categorised as enrichment type lessons, there was some evidence that the second series on mental health stimulated further thought among pupils. Children were invited to submit written questions to the psychiatric social worker taking part in the programmes. Many interesting and pertinent questions were received from viewers in both schools.

More research into the type of programme likely to elicit a desirable response from pupils is recommended. In these programmes priority should be given in production to raising interest and motivation levels rather than improving information gain.

Can a specialist teacher be employed to greater advantage using closed-circuit television ?

Within the context of this investigation it was possible to present successful lessons, including instruction, questions, working and correction of exercises, for a full class period of 35 minutes. Considerations of adequate lesson preparation, involving accurate instructions, precise timing and presentation to limited ability ranges, made this an exacting task. In spite of inherent difficulties, it was successfully accomplished. No evidence is available on the effects of prolonged instruction of this kind, but it is hypothesised that some evaluation of pupils' progress would be necessary for them to make a sustained effort over a period of time. Possibly individual graphs of pupil progress could be used to advantage. However, there would still be a place for the supervising teacher to commend and encourage efforts.

An approach to the question of using non-specialist teachers was made in the Trigonometry series. In School A viewing classes were supervised by teacher trainees from Portsmouth College of Education. None of the supervisors was a Mathematics specialist. Teachers and pupils were issued with comprehensive teaching notes and work sheets. Instruction was given via the television medium by the Head of the Mathematics Department in School A for approximately 15 to 20 minutes.

The capable delivery of lessons, and careful preparation of teaching notes and work sheets by the specialist teacher, undoubtedly assisted supervisors in the unfamiliar situation. One trainee only reported that the task of conducting follow-up work proved difficult. This teacher was responsible for the fourth stream of the third year group in a County Secondary School. Children comprising this class were less able academically than most of their contemporaries. Towards the end of the series most were incapable of comprehending the content of the television lesson. It will be recalled that the Trigonometry series was directed at a wide ability range. The supervising teacher was, therefore, in the position of having to re-teach the lesson at a speed and difficulty level more appropriate to the abilities of the class.

It would appear that, as long as television material is suitable, non-specialist teachers can deal competently with follow-up work if they receive adequate assistance in the form of comprehensive teaching notes and follow-up exercises for pupils.

What is the role of the supervising teacher in the classroom ?

In this investigation, the responsibility of the teacher in the classroom varied between attention to physical viewing conditions and class discipline, and an active, original contribution to lesson presentation. Involvement within these two extremes was dependent partly on the type of television lesson, and partly on the attitude of the teacher towards television as a medium of instruction.

No attempt was made in the present investigation to measure teachers' attitudes. However, it was observed that among the most successful television lessons, that is, those in which experimental groups achieved significantly superior results to conventionally taught classes, were those in which the classroom teacher made direct use of programme material. In the second English experiment, which is not reported in detail, the classroom teacher had previously introduced children to a style of writing particularly suitable for homework requirements. The original contributions of both television and classroom teachers resulted in a highly significant superiority of this class over a matched control group.

The extent to which supervising teachers could successfully integrate their own contributions with television instruction depended, to a large extent, on the availability of prior information on lesson content. Teachers find it difficult to watch the screen carefully for information and to supervise a class at the same time.

What are the attitudes of pupils towards television lessons ?

For purposes of comparison, matched non-television control groups and experimental viewing groups were selected, within one school, from each of two age levels. Ages of younger pupils ranged between 11 and 12 years with an average of 11·9. The third year groups were between 13 and 14 years.

A pre-tested "Attitude to Television" scale containing statements of the following kind was used as the measuring instrument:-

"We could learn a lot in television lessons."

"I would not like watching television lessons."

All children were tested before transmissions began. No differences were registered among groups in attitudes to television lessons. On the average, pupils were positively orientated towards the anticipated programmes.

At the end of the experimental investigation the attitude scale was re-administered to all groups. A statistically significant deterioration in attitude was obtained for both control and experimental groups, with the decline more marked among younger pupils.

The measured negative reactions may have been due to:—

(i) The filmed French series presented via television to the younger groups.

(ii) The lack of feed-back of homework results to pupils.

(iii) The intensive testing programme necessary for objective evaluation.

(iv) The established viewing habits and preferences on open-circuit television.

(v) The technical failures in reception.

(vi) The television lessons generally.

Most supervising teachers reported that slower first year pupils who received the filmed French programmes were not very interested in the lessons, and were reluctant to participate with oral responses. If the series was responsible for the changes in attitude, contamination must have occurred between younger and older pupils. As they were in the same school, this is not unlikely, but the extent of the transfer of attitudes is not known.

Apart from the possible influence of the frequently presented French films, one interpretation of the attitudes registered is that there was little feed-back to pupils of results of objective testing. Experimental conditions rendered it difficult to keep pupils informed of their progress. Children thought they learned less from television lessons and that it was harder to learn through the medium. In fact, in most cases they retained more information, apparently with less conscious effort. This lack of knowledge about their progress, coupled with a heavy testing programme associated with television, could have been partly responsible for attitude changes.

On the other hand, established viewing habits on open-circuit television may also have contributed. No differences were recorded in the average daily viewing times for the four groups (approximately 3 hours in the winter). Most pupils are sophisticated viewers and expect a high standard of presentation and technical efficiency. Occasional failure of sets, involving sound and more frequently, picture reception, could have affected their attitudes generally. In addition, a considerable proportion of home viewing time was devoted to entertainment type programmes, particularly among younger pupils. Older viewers watched "The News" more consistently. This fact could explain the more positive attitude of the television group at the older age level. They had learned to regard television as a source of useful information, and this attitude may have carried over to their reception of television lessons in school.

Whatever the cause, the conclusion is that at the end of the experimental investigation, children did not favour television instruction generally. This overall conclusion does not necessarily conflict with teacher/observer assessments of pupils' interest in programmes produced in the studio. Data collated from lesson evaluation forms revealed that, for the majority of these programmes, most or all pupils appeared very interested.

What are the advantages of closed-circuit as opposed to open-circuit television ?

Among the programmes included within the compass of the Objective Assessment were those on Local History, Road Safety, and Careers in South-East Hampshire. Each series incorporated information exclusive to the local environment. No comparisons were possible concerning the desirability or effectiveness of presenting similar information on a national or regional scale.

It has been noted previously, however, that the slight superiority of television groups in the parent school, compared with matched classes in linked schools, may have been due to one or a combination of several factors. Among those discussed was the possibility that programmes inevitably tended to be more closely integrated with the normal working life of the parent school. Problems associated with administrative difficulties and curricula differences among schools are discussed under the operation of The Link. If physical and psychological remoteness from the studio is a determinant of pupil performance, obtained differences may be increased when the transmission area is extended.

Any preference for closed-circuit as opposed to open-circuit television must be influenced by administrative rather than learning considerations. In the classroom the source of information is irrelevant.

PART II. CHAPTER 6.

FINDINGS

1. Performance of pupils of all ability levels included in the investigation improved when television lessons were adapted to take advantage of the visual potential of the medium.
2. Pupils of limited abilities, particularly, were adversely affected by the presentation of blackboard type programmes lacking in illustrated material.
3. Experienced specialist teachers found it impossible to vary pace and content of individual programmes to suit a wide ability range.
4. Lessons were most successful when directed at levels of ability restricted to approximately 10 I.Q. points.
5. When direct blackboard type programmes, plus teacher follow-up, were received by higher ability groups (average I.Q. 111.5), pupils performed as well as matched control groups on tests of information.
6. When illustrated, rehearsed television lessons were followed by teacher discussion and consolidation, viewing groups achieved superior average scores to those of matched control classes.
7. An illustrated television lesson, involving a shorter period of instruction and without teacher follow-up work, proved more successful than a classroom lesson in which similar material was presented.
8. In some experiments, pupils in linked schools learned as much as comparable television groups in the parent school; in others, they learned less.
9. In most cases, television classes in remote schools learned as much as control groups in the parent school.
10. There was no evidence to suggest that performance improved significantly when the teacher was personally known to viewers.
11. The time required for presenting information by means of an illustrated television programme was approximately half that necessary for the delivery of similar information using conventional methods.
12. In general, programmes of approximately 20 minutes proved a suitable length for presentation of information.
13. A successful television lesson of 40 minutes duration was presented, complete with instruction, recapitulation and consolidating exercises.
14. In a re-test situation after a time interval of 6 weeks, there was no difference in recall of information between viewing and non-viewing groups of higher ability.
15. On the re-administration of a test of information, a lower ability television group retained a greater proportion of their original learning than a control group.

16. The use of two-way sound did not appear to affect performance when several classes were taught simultaneously.
17. Pupils seemed to enjoy hearing questions and answers between the studio and classrooms.
18. In a multiple class situation, it was difficult to operate talk-back facilities.
19. Teachers and observers frequently used two way sound apparatus to communicate reception difficulties and classroom arrangements to the studio.
20. Children spontaneously participated in lessons when instructions from the television teacher were clear and concise, and the difficulty level of material was appropriate to their abilities.
21. Unless specific instructions calling for written responses were given, the usual classroom technique of question and answer was not successful.
22. The successful use of music depended upon whether selection and application was appropriate and reinforced the visual information.
23. Pupils quickly became familiar with note taking procedures and experienced little difficulty as long as provision for this activity was made in presentation of programmes.
24. Socially determined attitudes were not modified as a consequence of presentation of verbal, discussion type programmes.
25. A gain in information was registered among pupils after discussion type programmes were viewed.
26. There was no evidence of any change in pupils' attitudes towards particular subject areas as a result of the inclusion of enrichment type programmes in the curricula of schools.
27. Both older and younger pupils (13+ and 11+ years) watched a high proportion of entertainment type programmes on open-circuit television for an average of approximately three hours daily during the winter months.
28. Most children appeared very interested in productions originating in the studio.
29. Teachers reported that, with some exceptions, pupils continued to show interest in locally produced programmes when reception was below standard.
30. Slower pupils, particularly, showed little interest and were reluctant to participate in a series of filmed French lessons.
31. A significant deterioration in attitude towards closed-circuit educational television generally was registered for older and younger television and non-television groups at the end of the experimental session.
32. Older pupils were more positive in attitude towards closed-circuit television than younger groups.
33. Older pupils watched information type programmes on open-

circuit television more consistently than younger pupils.

34. Initially, younger children in the television class did not fulfil homework requirements as conscientiously as members of a matched conventionally taught group.
35. Teachers requested that lesson notes be supplied prior to presentation of programmes.
36. Non-specialist and subject teachers had little difficulty in conducting follow-up work when comprehensive teaching notes and pupil work sheets were issued.

PART III

THE FUTURE OF CLOSED-CIRCUIT TELEVISION IN SCHOOLS

1. The experience gained during the Warblington Experiment points to a number of possible future applications of closed-circuit television in schools.

   The camera can be used effectively within the one classroom or laboratory for the magnification of detailed processes. The necessary equipment is simple and relatively cheap. Prospective users of such equipment should not assume automatically that later additions can be made to the apparatus on a meccano principle, and its uses extended. Much simple equipment is best confined to the modest task for which it was designed. It is better to select the field in which to use television and then obtain the most suitable equipment for the task.

2. Classrooms can be linked by closed-circuit television. Teachers may welcome the opportunity of observing the technique of their colleagues. A subject department can develop team teaching. There are difficulties in teaching both to a class and to a camera. On balance, it is not thought wise to mix the two teaching situations.

   For the most successful presentation of television teaching material a studio is required, fully equipped and staffed. Such a studio would be linked to all the teaching institutions within a compact locality. Each school or college could have a number of monitors. The selection of material should be then made by teachers according to their special needs. Individual institutions should retain their autonomy in time-tabling and curriculum matters. Radio and open-circuit television can be rediffused through this closed-circuit system.

3. In a very large school or campus, television with programmed learning will change conventional teaching methods. Exposition can be effectively presented to a large television audience. The important factor is not the size of the audience but the ability range within it. Television is a most adequate teaching medium for presenting information. The use of a large viewing group releases teachers for specialised tutorial work with smaller groups. The tutorial can be the most elementary programmed learning situation. The pupil/teacher relationship can develop in a manner unattainable in classes of 40. Exposition then, is effective with groups larger than traditional school classes; tutorial work is undertaken in the teacher/pupil face-to-face situation with smaller groups.

4. The impact on school architecture could be considerable. No longer would the classroom as a prime teaching base be a typical feature of schools. Movable walls and flexible structures would provide for the mass audience and the small tutorial cell. A central audio-visual department would provide teachers in all parts of the building with teaching aids (speech, music, illustrations, magnification, film and television) at the turn of a switch. Teachers would then have the resources to undertake their expository and tutorial roles more effectively. No longer would subject teaching be class-centred.
5. Some curriculum control is implied in this. The class teacher would surrender some independence. The television teacher would be subject to the review of the programme director. There must be give and take, but inevitably the director would have the last word.
6. With the growing use of television in schools, student teachers must be kept in touch with developments. They will use television for child and class observation. Colleges of Education will want to arrange for their students to receive training in the new teaching techniques under Studio conditions.
7. The relative roles of film and television are often misunderstood. Television is not an alternative to the educational film which will continue to be used as a legitimate audio-visual aid in its own right. A television studio can mobilise a wide range of audio-visual devices including film. Telecine facilities will enable full length films to be shown and can also provide for film inserts to illustrate teaching points in particular programmes. Live television can capture the fine admixture of spontaneity and order so essential to good teaching. Repetition obtained by video-tape recordings can possibly be cheaper than film in the long run. The future will see the continued use of educational film together with the emergence of television supplemented with telecine and video-tape recording facilities. Both film and television can be usefully and separately employed in the service of education.
8. The control of a local Schools' Television Service will be a new educational role. The Director and his staff will serve the needs of local educational institutions. This will require a flexible structure and new administrative and professional relationships with local head teachers and principals of colleges.
9. The use of television on any large scale is costly. The control room of the Warblington Studio described in Part I incorporates labour-saving devices that can reduce costs in the long run. Given the economic use of resources, adequate funds must be available to provide for equipment and personnel.

10. Television can be introduced to provide an extra weapon in the teacher's armoury, but the traditional values of all concerned with the education of young people must remain. It is easy for the users of audio-visual devices to become obsessed with gadgetry. The machine must serve the master; the master must be the teacher. The teacher will continue to pursue his traditional role but with new mechanical aids. It is the teachers in touch with the needs of young people who are best qualified to make the full use of closed-circuit television in education. Traditional values then will remain, but new attitudes are bound to emerge. These will affect the roles of the teacher and the heads of schools and the way in which funds are allocated and buildings designed by administrators and architects.

11. The dichotomy between the humane arts and the mechanical sciences is long out of date. Members of a modern teaching profession must understand both people and machines. The challenge is for teachers fully skilled in the human situation to acquaint themselves with any technical aid of proved value. It is inevitable that the use of mechanical devices in learning processes will be extended. In this development television is destined to play an integral part in the work of the schools.

12. Teachers must be encouraged to come to terms with new techniques that can be shown to be of value. The dangers arising from the misuse of communication media will not be overcome by pretending that the media do not exist. It is by ignoring new developments that teachers will bring about the very situation they wish to avert. Full participation in new developments by an increasing number of teachers is the best guarantee that television is used for the full benefit of the young people in their charge.

13. **CONCLUSION**

Closed-circuit television is a valuable aid to teaching and ranges from small scale applications to the operation of a studio relaying programmes with a local flavour to a large number of institutions. For students in training, class observation and child study facilities can be provided. A training studio is necessary to develop the techniques of television teaching. Salient administrative considerations are finance, staffing and technical maintenance. The educational position is that most pupils gain information from the screen at least as easily as they do in the classroom, and under some conditions the evidence is certainly in favour of the use of television. With teacher preparation and follow-up work, television can be very effective. Inasmuch as teaching is more than presenting information, the tutorial relationship in the classroom will continue; when large viewing groups are used more staff could be available for this vital tutorial role. The degree to which the potential growth of closed-circuit television will be realised in the educational field depends upon the opportunities available to teachers and students to develop the type of knowledge and experience described in this report.

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